Exhibit C

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

IN RE: TFT-LCD (FLAT PANEL) ANTITRUST LITIGATION	Master File: 07-MD-1827 SI
THIS DOCUMENT RELATES TO:	
THE AASI CREDITOR LIQUIDATING TRUST, v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-05781-SI	
INTERBOND CORPORATION OF AMERICA, v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-03763-SI	MDL No. 1827
ALFRED SIEGEL, AS TRUSTEE OF THE CIRCUIT CITY STORES, v. AU OPTRONICS CORPORATION, et al. No. 10-cv-5625-SI	
COMPUCOM SYSTEMS, INC., v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-06241-SI	
JACO ELECTRONICS, INC., v. AU OPTRONICS CORPORATION, et al. No. 11-cv-02495-SI	
METROPCS WIRELESS, INC., v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-00829-SI	
NECO ALLIANCE LLC, v. AU OPTRONICS CORPORATION, et al. No. 3:12-cv-01426-SI	
OFFICE DEPOT, INC., v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-02225-SI	

P.C. RICHARD & SON, et al., v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-04119-SI	)
SB LIQUIDATION TRUST, v. AU OPTRONICS CORPORATION, et al. No. 10-cv-5458-SI	)
TECH DATA CORPORATION, et al., v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-05765-SI	)
TRACFONE WIRELESS, INC., v. AU OPTRONICS CORPORATION, et al. No. 3:10-cv-03205-SI	)
SCHULTZE AGENCY SERVICES, LLC, on behalf of TWEETER OPCO, LLC, et al., v. AU OPTRONICS CORPORATION, et al. No. 3:11-cv-03856-SI	)

EXPERT REPORT OF JAMES A. LEVINSOHN AND EDWARD A. SNYDER

October 31, 2013

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I. INTRODUCTION

A. Qualifications of James A. Levinsohn

1. My name is James Levinsohn. I am the Charles W. Goodyear Professor of Global Affairs at Yale University, Professor of Economics at the Yale School of Management, the founding Director of the Jackson Institute for Global Affairs at Yale, and a Research Associate of the National Bureau of Economic Research.

2. I received my Ph.D. in Economics from Princeton University in 1988. Before that I had also received an M.P.A. from the Woodrow Wilson School of Public and International Affairs at Princeton University in 1985 and a B.A. from Williams College in 1981. From 1988 through 2009, I was on the faculty of the University of Michigan. I have taught courses in Industrial Organization (Ph.D. level), International Economics (Ph.D., Masters, and undergraduate levels), Microeconomic Theory (Masters level), Development Economics (Ph.D. level), and Applied Econometrics (Masters level).

3. I have published in peer-reviewed journals and elsewhere on topics in industrial organization, applied econometrics, international trade theory and policy, as well as other areas. My published work includes papers on the econometric modeling of consumer choice among differentiated products, how firms set prices in oligopolistic markets, how antitrust and trade policy interrelate, and how firms in imperfectly competitive markets respond to regulation. Most of my academic research involves econometric analysis of microeconomic data, including work that addresses the econometric implications of unobserved product quality for the estimation of demand for differentiated products.[1]

4. I have served as the co-editor of the *Journal of International Economics* and on the editorial boards of the *American Economic Review*, *Journal of Economic Literature*, and the *Review of Economics and Statistics*. In addition, I regularly serve as a referee for journals in many fields of economics.

[1] See, for instance, Berry, Steven, James Levinsohn, and Ariel Pakes, "Automobile Prices in Market Equilibrium," *Econometrica*, Vol. 63(4), July 1995, pp. 841-890.

5. I have been retained by counsel on LCD-related matters since November 2011. I have directed employees of Analysis Group, Inc. (Analysis Group), an economics research and consulting firm, to assist me in this assignment. I am being compensated at an hourly rate of $750 for time spent on the matter. In addition, I receive compensation based on the professional fees of Analysis Group. No compensation is contingent on the nature of my findings or on the outcome of this litigation.

6. I have consulted in antitrust-related and other business-related matters in several industries and have also consulted for several international organizations and governments. My expertise is described more extensively in the attached curriculum vitae (see Appendix A). A list of the cases in which I have submitted expert testimony during the past four years is provided in Appendix B.

B. Qualifications of Edward A. Snyder

7. I am Dean of the Yale School of Management and the William S. Beinecke Professor of Economics and Management. I assumed this position on July 1, 2011. From July 1, 2001 until June 30, 2010 I was the George Shultz Professor of Economics at the University of Chicago Booth School of Business and served as Dean of the School.

8. I began my professional career in July 1978 with the Antitrust Division of the U.S. Department of Justice as a Staff Economist to the National Commission to Review Antitrust Laws and Procedures. I worked as a Staff Economist in the Antitrust Division on a full- and part-time basis until 1984, working on antitrust investigations in a wide range of product markets involving manufacturers, service providers, distributors, and retailers. Since then I have worked in antitrust enforcement, conducted research on antitrust policy and business practices, taught courses in related areas, and consulted on antitrust matters.

9. I earned my M.A. in Public Policy and Ph.D. in Economics from the University of Chicago. My Ph.D. thesis focused on price fixing and examined enforcement of Section 1 of the Sherman Act by the U.S. Department of Justice; this involved reviewing over 200 price-fixing conspiracies. I began my academic career in 1982 at the University of Michigan

Business School and over time was promoted to Professor of Business Economics and Public Policy. My primary expertise is Industrial Organization, which is the field of economics that deals most directly with pricing and distribution of products, the interactions among competitors, contracting practices, and antitrust issues. My research draws on relevant theory, investigates real-world behavior, and is predominantly empirical in nature. I have conducted three scholarly projects on antitrust policy and enforcement with Thomas E. Kauper, Professor of Law at the University of Michigan Law School and former Assistant Attorney General in charge of the Antitrust Division, U.S. Department of Justice. I have been an editor of the *Journal of Law and Economics*.

10. I have analyzed economic and business issues in a rich variety of settings. I consider myself to be an expert on pricing practices, distribution of products, vertical integration and contracting, and industrial organization in general. I also consider myself to be an expert on allegations of price fixing and collusive agreements, monopolization, and other anti-competitive practices.

11. I have been retained by counsel on LCD-related matters since July 2008. I have directed employees of Analysis Group, Inc. (Analysis Group), an economics research and consulting firm, to assist me in this assignment. I am being compensated at an hourly rate of $1,000 for time spent on the matter. In addition, I receive compensation based on the professional fees of Analysis Group. No compensation is contingent on the nature of my findings or on the outcome of this litigation.

12. I include my curriculum vitae with my report as Appendix A. A list of cases in which I have provided testimony in recent years appears as Appendix B.

C. Allegations

13. Plaintiffs are entities that purchased and sold TFT-LCD panels (hereafter, "LCD panels") and/or purchased and sold finished LCD products (hereafter, "LCD products") that contained TFT-LCD or STN-LCD panels.[2,3,4]

14. Plaintiffs allege that the defendants and non-defendant co-conspirators (hereafter, the "alleged conspirators") conspired to fix prices of LCD panels starting in August 1998 and continuing through at least December 2006. Plaintiffs also allege that these conspiratorial efforts elevated (a) the prices of the alleged conspirators' LCD panels (hereafter, "alleged conspirator LCD panels") and (b) the prices of LCD products. Plaintiffs claim damages based on their purchases of LCD panels and LCD products, including products sold by alleged affiliates of the conspirators.[5]

D. Assignment

15. Counsel has asked me, Dean Edward A. Snyder, to provide an analysis of the LCD product industry relating to the plaintiffs' claims about the effects of the alleged price fixing and the estimation of potential damages to plaintiffs.

16. Counsel has asked us, Professor James A. Levinsohn and Dean Edward A. Snyder, to jointly address five topics: (1) the total dollar value of each plaintiff's purchases of alleged

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[2] Only TracFone is claiming damages based on purchases of products that contain STN panels. First Amended Complaint for Damages and Injunctive Relief, Demand for Jury Trial, *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, This Document Relates to Individual Case No. 3:10-cv-03205-SI, Master File No. M:07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, November 9, 2010, pp. 2, 48.

[3] Plaintiffs purchased LCD products such as computer monitors, digital camcorders, digital cameras, mobile telephones, MP3 players, notebook computers, portable DVD players, and televisions.

[4] We will sometimes distinguish between STN-LCD and TFT-LCD panels in this report.

[5] Alleged conspirators include defendants and non-defendant co-conspirators named in the plaintiffs' complaints. Alleged affiliates include non-defendant entities alleged to be affiliated with conspirators in the plaintiffs' responses to interrogatories. The alleged conspirators and alleged affiliates named in this matter are listed in Appendix F.

conspirator LCD panels;[6] (2) the extent to which overcharges on the prices of LCD panels would have been passed through to each plaintiff; (3) given the overcharges that would have reached each plaintiff, the extent to which each plaintiff would have passed these overcharges through to its customers; (4) the damages for each plaintiff if the prices of the alleged conspirator LCD panels that it purchased and sold had been elevated by specified amounts; and (5) various analyses in expert reports submitted by Prof. B. Douglas Bernheim, Prof. Roger Blair, Prof. Leslie Marx, and Dr. Karl Snow.[7]

17. In addition, we have been asked to calculate for each plaintiff the amount of damages attributable to each alleged conspirator, and to calculate damages under various scenarios

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[6] This includes alleged conspirator LCD panels that the plaintiff purchased directly from alleged conspirators, and alleged conspirator LCD panels that the plaintiff "purchased" when it purchased LCD products from alleged conspirators, alleged affiliates, or other third parties.

[7] Expert Reports of B. Douglas Bernheim, Ph.D., *In Re: TFT-LCD (Flat Panel) Antitrust Litigation,* Nos. 3:11-cv-05781-SI (hereafter "Bernheim AASI Report, June 13, 2013"), 3:11-cv-03763-SI (hereafter "Bernheim BrandsMart Report, June 13, 2013"), 10-cv-5625-SI (hereafter "Bernheim Circuit City Report, June 13, 2013"), 3:11-cv-06241-SI (hereafter "Bernheim CompuCom Report, June 13, 2013"), 11-cv-02495-SI (hereafter "Bernheim Jaco Report, June 13, 2013"), 3:11-cv-00829-SI (hereafter "Bernheim MetroPCS Report, June 13, 2013"), 3:12-cv-01426-SI (hereafter "Bernheim NECO Report, June 13, 2013"), 3:11-cv-02225-SI (hereafter "Bernheim Office Depot Report, June 13, 2013"), 3:11-cv-04119-SI (hereafter "Bernheim P.C. Richard et al. Report, June 13, 2013"), 10-cv-5458-SI (hereafter "Bernheim Syntax Report, June 13, 2013"), 3:11-cv-05765-SI (hereafter "Bernheim Tech Data Report, June 13, 2013"), 3:11-cv-03856-SI, (hereafter "Bernheim Tweeter Report, June 13, 2013"), MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 13, 2013;
Expert Reports of Leslie M. Marx, Ph.D., *In Re: TFT-LCD (Flat Panel) Antitrust Litigation,* Nos. 3:11-cv-03763-SI (hereafter "Marx BrandsMart Report, June 13, 2013"), 10-cv-5625-SI (hereafter "Marx Circuit City Report, June 13, 2013"), 3:11-cv-06241-SI (hereafter "Marx CompuCom Report, June 13, 2013"), 3:11-cv-00829-SI (hereafter "Marx MetroPCS Report, June 13, 2013"), 3:11-cv-02225-SI (hereafter "Marx Office Depot Report, June 13, 2013"), 3:11-cv-04119-SI (hereafter "Marx P.C. Richard et al. Report, June 13, 2013"), 3:11-cv-05765-SI (hereafter "Marx Tech Data Report, June 13, 2013"), 3:11-cv-03856-SI (hereafter "Marx Tweeter Report, June 13, 2013"), MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 13, 2013;
Expert Report of Dr. Karl N. Snow, Ph.D., *In Re: TFT-LCD (Flat Panel) Antitrust Litigation,* No. 10-cv-5458-SI (hereafter "Snow Expert Report, June 13, 2013"), MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 13, 2013;
Declaration of Roger D. Blair, Ph.D., *In Re: TFT-LCD (Flat Panel) Antitrust Litigation,* No. 3:10-cv-03205 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 6, 2013, (hereafter "Blair Declaration, June 6, 2013") .

that counsel believes may be relevant to the finders of fact in these matters. These calculations are provided in the appendices of this report.

18. Section II of this report contains Dean Snyder's industry analysis. Section III – Section VII contain analyses that respond to the joint assignments by Prof. Levinsohn and Dean Snyder. Section III is an overview of pass-through and damages estimation. Section IV discusses the economics of pass-through. Section V discusses the econometrics of pass-through. Section VI addresses certain analyses offered by Prof. Bernheim, Prof. Marx, Dr. Snow, and Prof. Blair. Section VII reports a large number of empirical results that are relevant to estimating damages for each plaintiff. These include estimates of pass-through, volume of commerce, and damage calculations for each plaintiff assuming that LCD panel prices were elevated by specific amounts due to the alleged price fixing. We include in Appendix C a list of materials considered in the course of executing our assignment.[8]

II. INDUSTRY ANALYSIS

19. In this section I apply an analytical framework to the "LCD industry," a term I use to cover the design and manufacture of LCD panels, the design and manufacture of LCD products, and the distribution of relevant inputs and products that ultimately lead to the purchases of LCD products by end-consumers. The analysis of the LCD industry, including the nature of supply and demand for LCD products, has implications for the likelihood that conspiratorial efforts to fix LCD panel prices – as well as related efforts to maintain and enforce the terms of the conspiratorial agreement(s) – would be successful in imposing substantial average overcharges over the period alleged by plaintiffs. The analysis also has implications for the degree to which alleged panel overcharges would be passed through distribution chains to customers, a topic that is discussed and analyzed empirically in Sections III-VII of this report.

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[8] Our preparation of Appendix C is consistent with the Stipulation and [Proposed] Order Regarding Procedures Governing Expert Discovery, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, Master File No. M07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, October 10, 2008.

A. Motivation for the Analytical Framework

20. The analytical framework for the analysis of the LCD industry that follows has long been used by economists evaluating the likely effects of price-fixing efforts. The industry analysis should not be viewed either as the end point of the evaluation of price-fixing efforts or as constituting a sufficient analysis. On the other hand, based on my experience in the Department of Justice, application of the underlying framework and a substantial industry analysis is the necessary starting point of the evaluation of price-fixing efforts, addressing the following specific questions:

- How would a price-fixing conspiracy work in this industry?
- Given actual industry conditions, how difficult would it be to specify the terms of a price-fixing agreement?
- How would these same conditions affect the incentives of firms to both agree to fix prices and to deviate from that agreement?

21. This underlying framework and its application to situations like this matter are consistent with insights developed in the broader economic literature. While some cartels succeed, others do not.[9] For example, Levenstein and Suslow state: "There are cases where cartels have continued to exist on paper for many years with little sustained effect on price."[10] Similarly, several recent studies have shown that cartels studied by economists have had weak effects, and sometimes no effects on prices.[11]

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[9] For example, Plaintiffs' expert Prof. Marx and her co-author emphasize the difficulty of managing a cartel when they argue that "Creating and running a successful cartel is, from our perspective, a remarkable accomplishment." See Marshall, Robert C., and Leslie Marx, *The Economics of Collusion: Cartels and Bidding Rings*, MIT Press, Cambridge, April 2012, (hereafter "Marshall and Marx, April 2012"), p. 138.

[10] Levenstein, Margaret C., and Valerie Suslow, "What Determines Cartel Success?" *Journal of Economic Literature*, Vol. 44(1), March 2006, p. 45.

[11] Boyer, Marcel, and Rachidi Kotchoni, "The Econometrics of Cartel Overcharges," *CIRANO*, March 2011; Komninos, Assimakis, et al., "Quantifying Antitrust Damages: Towards Non-binding Guidance for Courts," *Oxera*, December 2009, http://ec.europa.eu/competition/ antitrust/actionsdamages/, (hereafter, "Assimakis, et al., December 2009"), pp. 90-92.

B. The Analytical Framework

22. The analytical framework incorporates that (i) firms with market power have an incentive to conspire to fix prices – which requires that they reduce their output from the level they would produce absent the price-fixing conspiracy, and (ii) that such price-fixing conspiracies (cartels) will be difficult to coordinate and maintain given the incentives of individual firms to deviate from the agreement and to compete for more sales.[12]

23. The analytical framework derives in large part from the work of Nobel Laureate George J. Stigler, who illuminated the industry conditions under which individual firms would have particularly strong incentives to depart from agreed-upon prices to secure additional sales, and, therefore, when cartels would have difficulty in reaching and maintaining a price-fixing agreement, especially cartels that attempt to impose substantial overcharges over a long period of time.[13] As plaintiffs' expert Prof. Marx has noted, "secret deviations" by an individual firm can weaken the effectiveness of a cartel and may cause it to fail completely in its effort to increase prices.[14] Put differently, to raise and maintain prices that are elevated by a significant percentage, the cartel must prevent individual firms in the price-fixing conspiracy from deviating from the agreement and competing for more sales.

24. Therefore, while an effective cartel may yield benefits for those involved, there are costs associated with reaching and maintaining price-fixing agreements that must be incurred by

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12 Marshall and Marx, April 2012, p. 138.

13 Stigler, George J., "A Theory of Oligopoly," *Journal of Political Economy*, Vol. 72(1), February 1964, p. 46.

14 Deposition of Leslie Marx, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, This Document Relates to Track 2 Cases, Master File No. 3:07-MD-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, October 9, 2013, (hereafter "Marx Deposition, October 9, 2013"), p. 78:17-25.

> Q. And so that sentence means that a cartel will fall apart if it has only a pricing structure and no allocation or enforcement structures, correct? A. It says it will almost surely result in secret deviations, and those are hard on a cartel. Q. To the demise of the cartel, correct? A. To the demise of the cartel.

the cartel's members.[15] The standard industry analysis provides insights as to how these benefits and costs vary with structural characteristics of the industry. As indicated above, in considering an econometric or other empirical analysis of a cartel's effectiveness, it is particularly relevant to consider whether the results of an econometric analysis are sensible in light of the relevant structural characteristics of the industry.[16] I note as well that estimating the effects of cartels is often difficult.[17] As a result, it is often useful to consider estimates of overcharges with the benefit of a careful industry analysis.

25. Various industry characteristics are relevant in considering the extent to which a cartel can succeed in fixing prices, which as indicated, requires that firms reduce output and that individual firms do not respond to higher prices by seeking more sales. These characteristics can be usefully categorized as *supply* factors and *demand* factors.

i. **Supply factors**

a. **Changing identities among competitors**: In general, the relevant costs of ensuring compliance with any agreement are likely to be lower when there are fewer parties to the agreement.[18] In addition, shifting identities among competitors, whether through entry and exit of competitors, or mergers, joint ventures and other agreements, may destabilize cartels and make it more difficult for a cartel to agree to fix prices. Each time a new firm enters the market, questions arise about whether and how that firm will be incorporated into the cartel.

b. **Market shares:** In general, the relevant costs associated with managing and ensuring compliance with a cartel agreement are lower when cartel members are of similar size,

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15 Marx Deposition, October 9, 2013, p. 67:14-17, "Successful, explicit collusion requires planning, investments in administration, clear thinking, and hard work."

16 Davis, Peter, and Eliana Garces, *Quantitative Techniques for Competition and Antitrust Analysis*, Princeton University Press, Princeton, 2010, (hereafter "Davis and Garces, 2010") p. ix.

17 Assimakis, et al., December 2009, p. iv; Davis and Garces, 2010, pp. 351-352.

18 Bolotova, Yuliya V., "Cartel Overcharges: An Empirical Analysis," *Journal of Economic Behavior & Organization* Vol. 70(1), 2009, pp. 321-341.

and when their market shares are consistent over time.[19] When market shares shift, questions are likely to arise about the underlying reasons. A firm with declining share may reach the conclusion that other firms are not adhering to the agreement to maintain elevated prices and, as a result, may decide to cut prices, thus undermining the agreement. Similarly, to the extent that firms outside the cartel gain or lose share, it may be difficult for the cartel to diminish competition and effectively raise prices.

c. **Heterogeneity in supply and distribution among competitors**: If some firms involved in the cartel are vertically integrated, the costs of gaining adherence to the agreement are likely to be higher given that vertically-integrated firms sell different products to a broader set of customers, and monitoring internal sales can be more difficult than monitoring market prices. To maintain their agreement, the cartel members would need to monitor the conduct of vertically- integrated members in finished product markets, where products may be more complex and where it is more difficult for cartel members to form expectations about the effect of the cartel on sales and prices.

d. **Firm cost structures**: Cartels are likely to be more effective at constraining competition when average costs and marginal costs are constant or increasing with output. Individual firms have less incentive to deviate from the agreement in secret and increase output when there are limited returns to scale. By contrast, firms with substantial fixed costs will often experience significant returns to scale, and will have stronger incentives to increase output given that those sales will yield relatively higher per-unit profits at the margin.[20]

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[19] Harrington Jr., Joseph E., "Detecting Cartels," in Buccirossi, Paolo ed., *Handbook of Antitrust Economics*, The MIT Press, Cambridge, 2008; Levenstein Margaret C., and Valerie Y. Suslow, "What Determines Cartel Success?" *Journal of Economic Literature*, Vol. 44(1), March 2006, pp. 43-95; Bolotova, Yuliya V., "Cartel Overcharges: An Empirical Analysis," *Journal of Economic Behavior & Organization* Vol. 70(1), 2009, pp. 321-341.

[20] Mookherjee, Dilip, and Debraj Ray, "Market Structure Under Learning-By-Doing and Increasing Returns," *The Review of Economic Studies*, Vol. 58(5), October 1991, p. 995; Carlton, Dennis W., and Jeffrey M. Perloff, *Modern Industrial Organization, Fourth Edition*, Addison Wesley, 2005, p. 139.

e. **Innovation:** It is well understood that rapid innovation, which can lead to shifts in market shares as well as entry and exit, tends to make cartels less effective. Innovations may create advantages for certain rivals attempting to collude, and at the same time may make it more difficult for rivals to punish one another when individual firms deviate from the cartel agreement.[21]

ii. **Demand factors**

a. **Product differentiation**: It is easier for a cartel to limit competition when products are homogenous and differentiation is limited, as it will be easier to detect changes in price that result from non-compliance as opposed to changes that result from differences in the characteristics of products.[22] Innovation often contributes to significant product differentiation. If one firm improves its product on particular dimensions, then a fully-functioning cartel would need to account for these improvements in the price-fixing agreement. This type of difficulty in detecting deviations from the cartel agreement is enhanced when product differentiation exists both in an input and a finished product where the input is used.[23]

b. **The rate of new product introduction**: The costs of cartel enforcement tend to be higher when technology drives changes in product offerings, which are manifest in frequent product introductions. Each time new products with new capabilities are introduced, questions arise about how these new products should be priced –if they are to be priced within the terms of the price-fixing conspiracy. Furthermore, as we will discuss in the joint section of this report, the rapid introduction of new products can also lead to

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[21] Ivaldi, Marc, et al., "The Economics of Tacit Collusion," *IDEI*, March 2003, pp. 32-35; Jacquemin, Alexis, and Margaret E. Slade, "Chapter 7: Cartels, Collusion, and Horizontal Merger," in Richard Schmalensee and Robert Willig, eds., *Handbook of Industrial Organization*, Elsevier North Holland, Amsterdam, 1989 (hereafter "*Handbook of Industrial Organization*, 1989") p. 420.

[22] Church, Jeffrey, and Roger Ware, *Industrial Organization: A Strategic Approach*, Irwin McGraw-Hill, 2000, pp. 321-322; Suslow, Valerie, "Cartel Contract Duration: Empirical Evidence from Inter-war International Cartels," *Industrial and Corporate Change*, Vol. 14(5), 2005, p. 722.

[23] Scherer, F. M., *Industrial Market Structure and Economic Performance,* Rand McNally College Publishing Company, Chicago, 1970, pp. 279-284.

fluctuations in demand across products, which has important implications for the pass-through of any overcharges into finished product prices.

c. **Stability of demand**: Markets in which demand is volatile over time would make it difficult for the cartel to suppress competition among members.[24] Unexpected shocks to demand for select products (positive or negative) make it difficult to form expectations about sales of those products and to rely on those expectations to identify non-compliance with a cartel.

26. In the remainder of this section, I will review conditions of the LCD panel industry, in particular noting the structure of the industry, its supply chain, and conditions affecting supply and demand. I will then examine the implications of these conditions for the effectiveness of any agreement to fix prices and the ability to maintain a comprehensive price-fixing agreement.

C. Implications of Industry Conditions for Overcharges and Damages

27. The LCD industry stands out as one of the most dynamic in recent years. Major new product lines for LCD products have been developed, quality and functionality of those products have improved dramatically even as prices have fallen precipitously, and the output of both LCD panels and LCD products has increased at an extraordinary pace. Hence, the LCD industry is the exact opposite of a stable industry in which the costs of reaching and maintaining high overcharges are relatively low. In the balance of this sub-section I evaluate various industry factors in more detail that expand upon this starting observation.

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[24] Levenstein, Margaret C., and Valerie Suslow, "What Determines Cartel Success?" *Journal of Economic Literature*, Vol. 44(1), March 2006, pp. 43-95; Dick, Andrew R., "When Are Cartels Stable Contracts?" *Journal of Law and Economics*, Vol. 39(1), April 1996, pp. 241-283; Suslow, Valerie, "Cartel Contract Duration: Empirical Evidence from Inter-war International Cartels," *Industrial and Corporate Change*, Vol. 14(5), 2005; Harrington Jr., Joseph E., "Detecting Cartels," in Buccirossi, Paolo ed., *Handbook of Antitrust Economics*, pp. 705-744, The MIT Press, Cambridge, 2008.

i. Supply factors

28. Several characteristics that can be categorized as relating to the supply of LCD panels stand out as likely to raise the cost of reaching and maintaining cartel agreements, and therefore are unlikely be associated with a cartel producing high average overcharges. First, the changing identities of firms in the LCD industry would likely make it difficult for an alleged cartel to impose high average overcharges. Second, changes in market share among competitors are inconsistent with a comprehensive output restriction by the conspirator LCD panel manufacturers. Instability in market shares among cartel members and increases in the shares of non-cartel members together would make it difficult for the alleged cartel to operate in an effective and consistent manner.[25] Third, differences in the capabilities of LCD industry competitors, including the use of different, more integrated distribution for finished products, would make coordination more difficult within the cartel. Fourth, the significant economies of scale in the LCD industry would exacerbate incentives for firms to deviate from a cartel agreement. Finally, the LCD industry is highly innovative in the manufacture, distribution and development of products, and innovation is well understood to compromise the effectiveness of any cartel in this industry.

a. Changing identities among competitors

29. As indicated above, cartels are likely to be more successful where there is stability among cartel participants, and particularly where there are a small number of participating firms and entry is limited. By contrast, Exhibit II.1 shows that the cartel is alleged to have involved at least 14 corporate entities at different times.[26] Further, within these groups, firms are alleged to have coordinated cartel activities across entities alleged to be related, or with which the company merged or entered into joint ventures. The exhibit further illustrates the various and complex relationships among firms that characterize the supply

[25] Significant changes in shares across firms in an industry over time are an indication that an effective cartel is not present. See Harrington, Joseph E., Jr., "Detecting Cartels," in Paolo Buccirossi, ed., *Handbook of Antitrust Economics*, The MIT Press, Cambridge, 2008, p. 245; Grout, Paul A. and Silvia Sonderegger, "The Quest for Cartels," *Issues in Competition Law and Policy*, Vol. II, ABA Section of Antitrust Law, 2008, p. 1090.

[26] I understand that InfoVision, also shown on the exhibit, is not alleged to have been a conspirator.

side of the LCD panel industry. Entrants during the period included alleged conspirators Chunghwa, AUO, CMO, HannStar, SVA-NEC, Toppoly, and InfoVision, which is not alleged to have participated in the cartel.[27] By contrast, some firms exited the manufacture of large LCD panels during the period.[28]

b. Market shares

30. As noted above, market share stability is associated with cartel success.[29] However, as presented in Exhibits II.2-4, the market shares of LCD manufacturers in the three large-panel categories (monitor, notebook, and television computer panels) shifted dramatically within the period of alleged price-fixing efforts. Broadly speaking, the share of Taiwanese manufacturers increases over the period, while conspirator firms located in Japan lose share rapidly. Share shifts are even more pronounced for small panels used in mobile phone handsets, digital camcorders, and digital cameras, as shown in Exhibits II.5-6.

31. Also of note, these exhibits depict the shares associated with non-conspirator firms as the grey segment at the top of each chart. For monitor panels, notebook panels and mobile phone panels (Exhibits II.2, 3 and 5) the aggregate share of non-conspirators is small

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[27] As discussed in my previous report, entry involves substantial investments. See Deposition of Scott Birnbaum, Samsung 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M 07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, February 19, 2009, (hereafter "Deposition of Scott Birnbaum, February 19, 2009"), p. 177.

> A. So the – the process for production capacity is pretty complicated. You – you need to look several years into the future because each new fab costs multiple billions of dollars to put in place.

See also, Hara, Yoshiko, "Sharp Takes Lead in Next-gen LCD Fab Race," *EETimes.com*, August 7, 2006, http://www.eetimes.com/electronics-products/other/4086111/Sharp-takes-lead-in-next-gen-LCD-fab-race.

[28] An example of such exit is the case of entities related to Toshiba Corp. I understand that a joint venture between Toshiba Corp. and IBM, Display Technology Inc. (DTI), produced large-area TFT-LCD panels from 1996 through 2002. In August 2001, Toshiba exited this joint venture. In 2001, Toshiba and Matsushita formed Toshiba Matsushita Display (TMDisplay), a joint venture. I understand that TMDisplay primarily produced small-area TFT-LCD panels. (See Exhibit II.1).

[29] Marshall and Marx, April 2012, pp. 228-229. Prof. Marx in her deposition claims that "If you see stable market shares, you need to evaluate that within the context of the market that you're looking at, the product and market and industry that you're looking at" to determine whether stable market shares are evidence of successful collusion. (Marx Deposition, October 9, 2013, p. 103:15-20)

compared to that of the alleged conspirators, but in many periods the share of non-conspirators declined.[30] One would expect that, all else equal, firms not adhering to a price-fixing agreement would undercut the cartel price and increase their revenue share. Therefore, this result is inconsistent with the incentives of non-colluding firms to increase output and capture sales from colluding firms.

32. This lack of share stability is also present for particularly important customers, and is inconsistent with successful efforts to allocate the benefits of the cartel on an on-going basis.[31] For example, Exhibit II.7 shows the fraction of LCD panels for use in notebook computers that Dell sourced from different suppliers for each year between 2003 and 2006. In 2005, for example, Dell purchased LCD notebook computer panels from nine suppliers.[32] There is considerable variation in the shares of Dell's vendors during this period. Sharp supplied 17 percent of Dell's LCD notebook panels in 2003, but only 3 percent in 2006. AUO, on the other hand, did not supply any LCD notebook panels for Dell in 2003, but supplied 19 percent of Dell's LCD notebook panels in 2006.

c. Differences in supply and distribution among competitors, including the degree of vertical integration

33. Another relevant feature of the finished LCD product industry is that several firms involved in the manufacture of LCD panels during the relevant period were also involved in, or had corporate relationships with entities that manufactured, sold or distributed finished LCD products. These firms, such as Sharp, Hitachi and Samsung, often sell finished LCD products under their own brand names. These involvements would further complicate the effort to monitor adherence to any alleged agreement. Some finished product manufacturers have corporate relationships with panel makers and may use LCD panels

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30 The notable exception is digital camera and digital camcorder panels, where the shares of non-conspirators were significant during the period (see Exhibit II.6); rivalry from outside the cartel could also pose a significant challenge to overall cartel effectiveness.

31 As I will discuss later, Prof. Marx has noted that an "allocation structure" is necessary for an effective cartel.

32 I understand from counsel that HannStar also reports having a small number of sales to Dell in 2005, but these sales are not reported by DisplaySearch.

manufactured by these related entities in their finished LCD products, but they may also source LCD panels from other manufacturers.[33] For example, Exhibit II.8 shows the fraction of LCD panels for use in monitors that Samsung sourced from different suppliers for each year between 2003 and 2006. While Samsung primarily used its own LCD panels in its monitors, it also sourced LCD panels from many other suppliers during this period. For example, in 2004, Samsung sourced LCD panels from at least six other suppliers. As a result, a Samsung-brand television may not contain an LCD panel manufactured by Samsung and instead may have an LCD panel manufactured by another alleged conspirator, such as AUO or SVA NEC. In the extreme, televisions sold by alleged conspirator Toshiba contain panels purchased almost exclusively from other firms.[34]

34. The presence of related entities that are alleged to have both participated in an LCD panel conspiracy or conspiracies, and competed with other third party customers of finished goods, represents a further challenge to a conspiracy. It would be more difficult to ensure

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[33] Deposition of Hiroshi Ishimura, Toshiba 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M 07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, March 27, 2009, pp. 45-46.

> Q: Where else did Toshiba Corporation get its LCD panels if not from TMD? […] A: Again, I will answer to the best of my recollection. They would be Samsung, LG, Sharp, Chimei, AU […] and probably there were other companies as well, but that's about all I can think of right now.

Deposition of Masahiro Yokota, Sharp, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M 07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, March 11, 2009, p. 109:5-12.

> Q. Did Sharp Corp have occasion to purchase panels or modules from other manufacturers for use in any of the LCD products we have been talking about? A. Yes, we have. Q. And from what manufacturers? A. The manufacturers, such as AUO or CMO.

[34] Deposition of Junnosuke Tojo, Toshiba Corporation 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M07-1827, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, March 31, 2009 (hereafter "Deposition of Junnosuke Tojo, March 31, 2009"), pp. 39:16-40:1.

> Q. But currently TACP does not sell any televisions utilizing LCD displays with LCD display panels supplied by Toshiba Matsushita? A. It does not sell. […] Q. Currently which manufacturers supply LCD displays to TACP for use in manufacture of televisions? A. As of right now, the two companies supply LCD displays: Samsung and LG.

compliance when some, but not all, cartel members could use LCD panels in finished LCD products they sold directly, rather than sell the LCD panels at market prices. The use of assemblers and the complexity of panel sourcing even by so-called "integrated" firms would make it difficult to align the incentives of various alleged cartel members, meaning some parties may find deviating from the agreement more profitable than others. Given the substantial vertical integration present for some alleged conspirators, a comprehensive conspiracy would likely need to maintain adherence to elevated LCD panel prices, as well as adherence to a vast array of finished LCD product prices that include overcharges, to achieve the necessary pricing and enforcement structures required for an effective cartel.

d. Firm cost structure

35. The high fixed costs and low marginal costs that characterize the manufacturing of LCD panels create powerful incentives for individual firms to seek more business, especially when prices are elevated due to a price-fixing conspiracy. Such actions naturally undermine the effects of efforts to fix prices. To state the challenge to the cartel somewhat more formally: as it succeeds, the cartel will produce gaps between elevated prices and marginal costs. These gaps in turn create incentives for firms to increase output. This incentive is particularly strong when, as in the LCD industry, fixed costs are high and marginal costs are comparatively low. Firms will seek more business and put downward pressure on prices to increase utilization of expensive fabs. Sometimes business people refer to the related benefits of spreading their fixed costs over a larger sales base by increasing output (lowering price).[35,36]

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[35] Mookherjee, Dilip and Debraj Ray, "Market Structure Under Learning-By-Doing and Increasing Returns," *The Review of Economic Studies*, Vol. 58(5), October, 1991, p. 995; Carlton, Dennis W., and Jeffrey M. Perloff, *Modern Industrial Organization, Fourth Edition*, Addison Wesley, 2005, p. 139.

[36] Deposition of Fumiaki Kunimoto, CMO Japan Co., Ltd. 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M:07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, March 12, 2009, p. 128:3-17.

> Q. […] What information can you tell me, if anything, about the utilization of the capacity at your fab? […] A. My recollection is that we were, essentially, in regard to utilization, using all the capacity that we had. Q. One hundred percent for the entire period 2001 through 2006? A.

36. The incentive for participants to sell more in the context of a price-fixing conspiracy – to "cheat" – is particularly pronounced during periods when demand for LCD panels are low and fabs are not fully utilized.[37] The difficulty of ensuring constant utilization of available capacity in the industry predated any alleged cartel activity, and even has a name within this industry, the "Crystal Cycle."[38] The Crystal Cycle refers to "the competitive interplay between the rivals that results in cycles of over- and under-capacity—*whether the companies will it or not*."[39] I document the pattern of capacity utilization among LCD manufacturers using data from DisplaySearch on panel capacity and output in Exhibits II.9 and II.10, for large and small LCD panels respectively.

37. Apart from this phenomenon, the effect of capacity utilization on cartel effectiveness is ambiguous. When capacity is not constrained for all cartel members (i.e., capacity utilization rates are low), the ability of a single member to increase its output and lower its average cost provides an incentive for it to depart from the cartel price.[40,41] However, if capacity is available for most or all members of the cartel, then the cartel members' ability to punish departures from the cartel price is increased. By contrast, when capacity is constrained and capacity utilization is high, the ability to punish departures from cartel prices is limited, but, individual cartel members may be unable to increase output and thereby depart from cartel prices to increase sales.[42]

Not a hundred percent. We were operating as close as possible to that. Q. That was your goal? A. Yes.

37 See Carlton, Dennis W., and Jeffrey M. Perloff, *Modern Industrial Organization, Fourth Edition*, Addison Wesley, 2005, p. 139.

38 For a discussion of the crystal cycle, see Matthews, John A., "Strategy and the Crystal Cycle," *California Management Review*, Vol. 47(2), Winter 2005, pp. 6-32.

39 Ibid., p. 18.

40 Knittel, Christopher R., and Jason J. Lepore, "Tacit Collusion in the Presence of Cyclical Demand and Endogenous Capacity Levels," Working Paper, September 26, 2006, p. 3.

41 Staiger, Robert W., and Frank A. Wolak, "Collusive Pricing with Capacity Constraints in the Presence of Demand Uncertainty," *RAND Journal of Economics*, Vol. 23(2), Summer 1992, pp. 203-220 at p. 205.

42 Compte, Olivier, Frederic Jenny, and Patrick Rey, "Capacity Constraints, Mergers and Collusion," Working Paper, November 9, 2003, p. 2; Knittel, Christopher R., and Jason J. Lepore, "Tacit Collusion

e. Innovation

38. Substantial technological change and rapidly declining prices, in part due to gains in the manufacturing process, characterize and explain the huge numbers of finished LCD products and their short product cycles.[43] Rapid changes in an industry complicate monitoring of price agreements. Costs may decline simply because of technological changes. Distinguishing departures from these "naturally occurring" price changes enhances the effectiveness of the enforcement mechanism. Unlike an industry in which prices are stable and reductions from agreed upon prices can be identified, the rapidly declining prices of LCD panels during the period would have increased the costs of identifying departures from agreed-upon prices.

ii. Demand for LCD panels and finished LCD products

39. Demand for LCD panels is derived from demand for finished LCD products. Several characteristics of demand for these products are also likely to raise the cost of reaching and maintaining cartel agreements. First, demand is heterogeneous and leads producers to differentiate both LCD panels and finished LCD products. Second, product life cycles are short; new products are introduced rapidly to respond to changing preferences among consumers. Third, demand for finished LCD products is driven by disruptive innovations and new applications, making some new products "must have" and others obsolete. Given the complexity of these products and the rate at which new products and new innovations are introduced, demand is highly volatile.

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in the Presence of Cyclical Demand and Endogenous Capacity Levels," Working Paper, September 26, 2006, p. 3.

[43] Dr. Souri documents the patterns of innovation in the LCD industry. See Expert Report of Shukri Souri, Ph.D., *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, This Document Relates to Track 2 Cases, No. 3:07-md-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, October 25, 2013, (hereafter "Expert Report of Shukri Souri, October 25, 2013"), pp. 1-3.

a. Product differentiation

40. Consumer preferences for finished LCD products are heterogeneous, and there are significant opportunities for the makers of finished LCD products to differentiate their products on multiple dimensions. Finished LCD product manufacturers combine innovative components along with the LCD panel to create televisions, notebooks, and monitors, as well as mobile phone handsets, cameras and other products. In Appendix L, I have provided several selected examples of prominent finished LCD products sold by Circuit City and Motorola in each product category with comparable display characteristics but that are differentiated on various other dimensions.

41. The LCD panel is just one component of these products, and is often a small part of the value added by finished LCD product manufacturers in the effort to differentiate those products. In Exhibit II.11, I report the LCD panel price as a percentage of finished LCD product cost, using data produced by the plaintiffs and alleged conspirators in this matter. While the percentages vary, the panel represents as little as 15 percent (notebooks) and as much as 56 percent of the finished product cost (monitors).[44] Not surprisingly, therefore, products such as notebook computers and mobile phone handsets include features that end users demand but that are unrelated to display characteristics. The subtables contained in Exhibits II.11.a- II.11.h provide the panel values and finished product values calculated for each plaintiff where relevant data were available.

[44] In my previous reports in this matter, I referred to similar estimates of the panel as a share of value of finished LCD products from public sources. The calculation in Exhibit II.11 uses the same method that Prof. Levinsohn and I will later use to calculate the volume of commerce for any damages in these matters. We used purchase data from plaintiffs in this matter to calculate the cost of finished LCD products by product type. We then identified the median price of LCD panel types contained in these finished LCD products, to calculate the value of the panels contained in these finished LCD products (see Appendix D for a description of the method by which the finished product and panel volumes are calculated). Using the value of finished LCD products as the denominator, and the value of associated LCD panels as the numerator, I am able to report the share of cost of each product type that is accounted for by the price of the LCD panel.

42. In addition to differentiation among finished LCD products, LCD panels are differentiated based on use and several important product characteristics.[45] Adjustments and improvements to size, resolution, brightness, contrast ratio, and other characteristics of LCD panels are nearly continuous over the period. Given product differentiation on these dimensions, LCD panels are frequently designed and built according to a particular customer's specifications.[46] The numerous and varying characteristics of the relevant LCD panels raise the costs of maintaining a comprehensive agreement.[47] These types of product differentiation and customization increase the costs of assessing whether actual prices adhere to the collusive prices.

b. Introduction of new products

43. Preferences among consumers of finished LCD products also change rapidly as products are differentiated in new and innovative ways. As a result, LCD product makers regularly

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[45] Declaration of Michael Blashe In Support of Defendants' Joint Opposition to Direct Purchaser Plaintiffs' Motion for Class Certification, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M 07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 25, 2009, (hereafter "Declaration of Michael Blashe, June 25, 2009"), pp. 4-5.

> Specifications from customers generally are of three types: mechanical, electrical and optical. The customized design will typically need to meet customer requirements with respect to features such as mechanical thickness, brightness and aspect ratio.

However, despite this customization, customers often source LCD panels from more than one qualified manufacturers. Declaration of Michael Blashe, June 25, 2009, p. 6.

[46] Declaration of Marshall Pinder in Support of Defendants' Joint Opposition to Direct Purchaser plaintiffs' Motion for Class Certification, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M:07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 25, 2009 (hereafter "Declaration of Marshall Pinder, June 25, 2009"), pp. 1-2; Declaration of Kevin Yang in Support of Defendants' Opposition to Direct Purchaser plaintiffs' Motion for Class Certification, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M:07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 18, 2009, p. 2; Declaration of Tadashi Yamada In Support of Defendants' Joint Opposition to Direct Purchaser Plaintiffs' Motion for Class Certification, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. M 07-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 25, 2009, p. 3; Declaration of Michael Blashe, June 25, 2009, p. 4.

[47] Motta, Massimo, *Competition Policy: Theory and Practice*, Cambridge University Press, New York, 2004, p. 146; Carlton, Dennis W., and Jeffrey M. Perloff, *Modern Industrial Organization, Fourth Edition*, Addison Wesley, 2005, p. 135.

introduce new LCD panel models and new finished LCD products. The high frequency with which LCD panel models change increases the costs of maintaining adherence to a comprehensive price-fixing agreement. As products cycle onto the market, it is potentially challenging to detect and distinguish departures from agreed upon prices. Similar to the problems associated with customized products, product turnover complicates enforcement of the cartel, increasing the burden associated with tracking relevant products. This in turn makes departures from any agreed upon prices more profitable as compared to circumstances when product cycles are long, products are less differentiated, and enforcement of the cartel is less costly.[48]

44. Like LCD panels, finished LCD products have short product cycles that are typically less than 24 months. As a result of innovations, product quality varies across products and relative product appeal changes over the life of each product.[49] This pattern of innovation is common across many manufacturers of finished LCD products and affects the prices of products that include the innovation but also of products from previous generations that do not. [50]

45. The rate of important product introduction in the LCD industry is striking. Based on the data produced by Prof. Bernheim alone:

- Dell introduced 34 new monitor models on average each quarter between 2001-2009;
- Philips introduced 15 new television models on average each quarter between 2001-2009;

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[48] Hay, George A., and Daniel Kelley, "An Empirical Survey of Price Fixing Conspiracies," Journal of Law and Economics, Vol. 17(1), April 1974, p. 15; Motta, Massimo, *Competition Policy: Theory and Practice*, Cambridge University Press, New York, 2004, p. 146.

[49] Incorporating product differences and product cycles is also critically important to empirical analysis of pass-on, as these factors will affect the prices of finished LCD products.

[50] Innovation by competitors has a similar impact. "Of course, a given innovation is followed not only by direct imitators and price competition but by further innovation by others and by the original innovator. These, in turn, tend to make the first innovation obsolete." Fisher, Franklin M., John McGowan, and Joel Greenwood, *Folded, Spindled and Mutilated: Economic Analysis and U.S. vs. IBM*, The MIT Press, Cambridge, 1983, p. 34.

- Motorola introduced 15 new mobile phone handset models on average each quarter between 2001-2009.[51]

46. In general, the degree of differentiation among these models varied from firm to firm, but the pattern clearly indicates that new finished LCD products are introduced rapidly, and as they are introduced, prior generations of products become obsolete.

c. Stability of demand

47. The extraordinary uncertainty about demand for different types of LCD panels itself would have made operating the cartel difficult. This uncertainty was fueled by the introduction of new application types often requiring different panels.[52] As documented in Exhibit II.12, total sales revenue of LCD panels for monitors, notebooks, and televisions grew from approximately $3 billion in 1999 to $81 billion in 2010. LCD panels for use in televisions were nearly non-existent in 1999 (sales were only $15 million), but in 2006, televisions became the largest application of use by revenue for large-area LCD panels with $22 billion in sales, and by 2010, sales of panels for televisions were greater than sales of the other two categories combined.

48. Similarly, as documented in Exhibit II.13, the demand for small panels was also unstable during the period, and driven by the introduction of new application types. For example, in 2001, the sales of small panels for digital camcorders ($267 million), digital cameras ($285 million) and mobile phones ($590 million) were relatively low compared with the more than $10 billion in notebook and monitor panels sold that year. However, in succeeding years, sales of camcorder panels increased only slightly (to $345 million by 2005), while sales of camera panels increased by a factor of five (to $1.5 billion) and mobile phone handset panels

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[51] In addition, data from Dell indicate they introduced at least 230 new notebook models each quarter, and Kodak introduced 7 new digital camera models each quarter. I have included these calculations in the supporting materials to this section of the report. See "Combined price and cost.dta," Backup Production to Bernheim Expert Report, June 13, 2013.

[52] Matthews, John A., "Strategy and the Crystal Cycle," *California Management Review*, Vol. 47(2), Winter 2005, p. 19.

increased by a factor of 14 (to $8.4 billion) by 2005. In addition, the portable DVD category was not even tracked by DisplaySearch until 2004.

49. As discussed in the next section, Prof. Bernheim suggests that compliance with cartel agreements could be ensured based on expectations about sales.[53] However, this mechanism would be less effective in an environment where innovative new applications were introduced to uncertain reception by consumers, driving substantial growth in some categories and stagnation in others.

D. Prof. Bernheim's View of the LCD Industry and Cartel Effectiveness

50. In his report, Prof. Bernheim takes the view that an empirically-oriented examination of industry conditions cannot yield meaningful insights about the potential effectiveness of a cartel or the operation of the cartel.[54] By contrast, in her published work and at deposition Prof. Marx has explained that factors and industry structures are relevant to a cartel's operation and to the critically important issue of preventing deviations from a price-fixing conspiracy that would undermine the cartel's ability to maintain elevated prices.[55]

51. Prof. Bernheim acknowledges that a cartel needs both information about whether parties are complying with the agreement, and the ability to impose "undesirable consequences" (to punish) non-compliance.[56] However, he claims that little if any direct monitoring of the LCD cartel would have been required for it to be effective. Instead, he focuses on the "imperfect ability to infer whether others are complying with the agreement."[57] According to Prof. Bernheim:

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53 Bernheim Circuit City Report, June 13, 2013, ¶¶92, 94.

54 Bernheim Circuit City Report, June 13, 2013, ¶¶76-99.

55 Marshall and Marx, April 2012, p. 7; Marx Deposition, October 9, 2013, pp. 74:25-75:2,"…Cartels, in order to charge secret deviations, need to put in place the pricing allocation and enforcement structures."

56 Bernheim Circuit City Report, June 13, 2013, ¶88.

57 Bernheim Circuit City Report, June 13, 2013, ¶91.

> The parties agree to either prices, quantities, or both. If they agree to one, they have clear expectations concerning the other. For example, if they agree to prices, then they each have expectations concerning their own sales, assuming that others also comply. Moving forward, if their sales satisfy their expectations, they assume others have likely complied and that the agreement is still in force. However, if their sales do not satisfy their expectations, they assume (in the absence of some other extenuating explanation) that others have likely not complied and that the agreement has collapsed (at least for the time being). As a result, they start cutting prices, and the collapse snowballs. After entering such an agreement, each cartel member knows that it can generate extra profits in the short run by cutting price and stealing business, but it is also aware that such action will likely lead other cartel members to infer that others are not complying, and hence cause the agreement to collapse, resulting in the loss of future profits for everyone. That undesirable consequence keeps the cartel members in line, even though there is no directed punishment or retaliation for transgressions.[58] (footnote omitted; emphasis added)

52. It is important to understand, according to recognized authorities, that "[t]his approach is the most direct descendent of Stigler's (1964) work on oligopoly."[59] If industry conditions are relatively stable over time, this conjecture is potentially reasonable and indeed consistent with the underlying analytical framework developed above. Under stable conditions, other factors such as new product introductions, differential growth rates, and new entrants would not generate "noise" in the market, in which case an individual firm's expectations about sales, prices, and shares could be evaluated in the context of relatively stable conditions. Indeed, the authors of the article relied on by Prof. Bernheim in his discussion of these issues note explicitly that their model applies to relatively stable industries (e.g., not involving significant product differentiation and product turnover) – a condition they recognize is limiting.[60]

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[58] Bernheim Circuit City Report, June 13, 2013, ¶¶92, 94.

[59] Shapiro, Carl, "Chapter 6: Theories of Oligopoly Behavior," in *Handbook of Industrial Organization*, 1989, p. 374.

[60] Green, Edward J. and Robert H. Porter, "Noncooperative Collusion under Imperfect Price Information," *Econometrica*, Vol. 52(1), January 1984, pp. 87-100, at pp. 90, 94.

In his report, Prof. Bernheim claims that Green and Porter's assumptions about industry structure are for "expositional ease, and are not essential for the general mechanism they describe." (Bernheim Circuit City Report, June 13, 2013, footnote 167.) While Green and Porter's model does assume that products are of homogenous quality, and firms face a common market price "for expositional ease"

53. When industry conditions do not allow cartel members to make reasonably accurate and timely inferences about whether other firms are adhering to the price-fixing agreement, then the model predicts that firms will lower prices. Thus, "a coherent theory of imperfect cartel monitoring must incorporate demand (or cost) uncertainty. Demand shocks are then confounded with rivals' defections."[61] One does not need to be an economic expert to recognize that, as observed above, the LCD industry has been one of the most dynamic and least stable industries in recent years: Firms introduce new products with high frequency, demand for products shifts dramatically in short periods of times, significant innovations are introduced, new applications are developed, and entry and exit of firms is observed. Given that the LCD industry conditions are not stable, firms would have encountered much more "noise" from market shifts than "signals" about cartel effectiveness. For example, if demand for a new product is lower than expected, a firm could interpret that shortfall as evidence of non-compliance by other cartel members or as weak demand. In the context of the LCD industry where products are highly differentiated and the rate of new product introduction is rapid, the difficulty of drawing correct inferences, therefore, increases dramatically.

54. Prof. Bernheim does not support his claim that individual cartel members could have used expectations to evaluate the effectiveness of the relevant agreements and achieve high average overcharges. Indeed, how could an individual cartel member know if prices on particular products included the expected overcharge when prices were falling dramatically, market shares were shifting, and new products were being introduced (and

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(p. 91), the authors articulate industry conditions such as temporal stability and the lack of product differentiation specifically "to address the question of exactly what sort of industry our model might appropriately describe." (p. 90) In fact, they note that the assumption of temporal stability is required "if the assumption that firms have rational expectations – an assumption that underlies the use of Nash equilibrium – is to be credible." (p. 90) They also note that if there is significant product differentiation, "even if one firm were suspected of violating a cartel agreement, other firms would have no way of isolating it and punishing it differentially." (p. 90) In summary, they recognize that "the assumptions about industry structure are quite restrictive," and that as a result, "the direct applicability of our model is severely limited." (p. 94).

[61] Shapiro, "Chapter 6: Theories of Oligopoly Behavior," *Handbook of Industrial Organization*, 1989, p. 374.

withdrawn) at a rapid rate? How could an individual firm square its expectations (conditional on the cartel agreement) with its actual business experience when overall output was rising rapidly, but output was shifting drastically within LCD product categories and within particular product lines and models? As discussed above, individual firms were winning and losing sales to important customers.

55. Prof. Bernheim does not address either (i) how a firm can reliably know if its individual expectations about market share were not met because other firms were not adhering to the agreement or because of factors outside the agreement, or (ii) how much the firm would have to lower prices beyond the manifestly downward trend in LCD panel and LCD product prices to enforce the agreement. Prof. Marx and her co-author have also noted that "[a] typical punishment is the abandonment of the attempt to collude."[62] Therefore, if the cartel identifies non-compliance correctly, then the cartel will engage in "non-directed punishments" of the kind described by Prof. Bernheim, leading to "a period of time during which prices are no longer elevated."[63] On the other hand, if the cartel misidentifies non-compliance where it does not exist, then the cartel will also engage in price-cutting. In other words, if the cartel detects cheating correctly, or detects it incorrectly where it does not exist, the result is that firms abandon the agreement and prices fall from their elevated levels.

56. Again, the standard industry analysis addresses the costs of acquiring information about compliance necessary to avoid this problem, which relates directly to expectations about LCD cartel effectiveness. Prof. Bernheim does not address how the many sources of instability in the market can be evaluated at the same time that the workings (or non-workings) of the cartel can be evaluated. In addition, Prof. Bernheim points to no punishment mechanism used by this cartel other than the ability of cartel members to depart from the substantially elevated prices agreed to by the cartel.

57. In her recent book *The Economics of Collusion*, Prof. Marx and her co-author do recognize that "it is often profitable for firms to secretly deviate from the collusive agreement," and

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62 Marshall and Marx, April 2012, p. 7.

63 Bernheim Circuit City Report, ¶93.

describe structures (originally explained by Prof. Stigler) necessary for a cartel to operate successfully. In particular, they argue that a successful cartel typically creates:

> (1) pricing structures that enable them to implement price increases, (2) allocation structures that allow them to divide the collusive gain and reallocate resources among one another when things do not go as expected and (3) enforcement structures that facilitate monitoring and establish the threat of punishment for noncontrite deviant behavior.[64]

58. In her deposition, Prof. Marx sets a somewhat more specific bar than Prof. Bernheim for the operation of a successful cartel. She argues that all three structures are necessary or "secret deviations" could lead to the demise of the cartel agreement.[65] For example, she describes the allocation structure as a mechanism to distribute profits among the firms in the cartel, and states that:

> [A]nother part of the allocation structure is a way for firms to fix mistakes, essentially. When there are deviations from agreed-to market shares or allocations, the cartels will often put in place some way of fixing or reallocating profits in order to get them back on track to the agreed-to allocation structure.[66]

59. Such an effort to "fix mistakes" and resolve conflicts among cartel members would certainly require more aggressive cartel activity than simply monitoring one's own expectations about market activity. Yet when asked, Prof. Marx could not describe such activity or allocation structure, deferring to evidence described in Prof. Bernheim's report.[67] Prof.

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64 Marshall and Marx, April 2012, p. 7.

65 Marx Deposition, October 9, 2013, p. 78: 17-25.

> Q. And so that sentence means that a cartel will fall apart if it has only a pricing structure and no allocation or enforcement structures, correct? A. It says it will almost surely result in secret deviations, and those are hard on a cartel. Q. To the demise of the cartel, correct? A. To the demise of the cartel.

66 Marx Deposition, October 9, 2013, p. 74:11-17.

67 Marx Deposition, October 9, 2013, pp. 82:23-83:22.

> Q. So what allocation structure did the TFT-LCD cartel use? [...] A. I was instructed to use Professor Bernheim's overcharges if I found them to be reliable, which I do. And so, of course, given that this is how I think about cartels putting in place these different types of structures, in my review of the conspiracy I notice along the way that fall into those various buckets. So for example, in terms of allocations structures, there are things in the record pointing to a customer

Bernheim dedicates a single paragraph to an alleged incident between two alleged conspirators regarding allocation of sales of mobile phone panels to one customer over a limited portion of the alleged conspiracy period.[68] Even if accurately depicted, this incident provides no evidence that such structure was in place for all the alleged cartel members across the breadth of the products whose prices were allegedly fixed by the cartel, or for the entire alleged conspiracy period. Such a limited, anecdotal "structure" would not be able to address the mistakes that would likely have occurred for a cartel operating in such an unstable and complex industry, and as such does not provide a compelling example of the kind of cartel-wide allocation structure Prof. Marx has discussed as a necessary aspect of an effective cartel.[69]

E. Conclusion

60. My assignment in this section was to analyze the LCD industry and derive implications regarding plaintiffs' claims about the likely effects of the alleged anticompetitive conduct and the estimation of damages in this case. Below, I will summarize those implications and set the stage for the completion of the damages assignment discussed by Prof. Levinsohn and me in the remainder of this report.

61. As discussed above, collusion is difficult because colluding firms have a strong incentive to secretly deviate from the agreement and gain sales from rival cartel members. Characteristics of the industry may affect the effectiveness of structures put in place by the cartel to limit these deviations and facilitate collusion. Economists tasked with assessing the overcharges imposed by a cartel should ensure that an econometric estimation of overcharges is consistent with expectations informed by those characteristics. In an

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allocation. Q. Could you describe the customer allocation, please? […] A. Not sitting here right now. I believe there's reference to it in Professor Bernheim's report.

[68] Bernheim Circuit City Report, June 6, 2013, ¶64.

[69] Bernheim Circuit City Report, June 6, 2013, ¶64; Marshall and Marx, April 2012, p. 7; Marx Deposition, October 9, 2013, pp. 73-75.

industry where the structures of the cartel would be less effective, high average overcharges over a long period would be unlikely and should be treated skeptically.

62. My analysis of the LCD industry, including several empirical inquiries, is typical of a standard economic analysis of a price-fixing conspiracy. Such an analysis helps answer the question, given the alleged efforts to fix prices, what would be the likely effects? Various characteristics of the LCD industry, such as the changing identities of industry participants, shifting market shares, product differentiation, short product cycles, and the extent of vertical integration among manufacturers, are consistent with relatively low average overcharges and are inconsistent with relatively high average overcharges. This analysis also indicates that it would have been difficult to maintain adherence to a comprehensive price-fixing agreement on LCD panels over a long period of time. Thus, my analysis is consistent with the estimated overcharges provided by Prof. Carlton, who finds 0.4 percent overcharges on large LCD panel prices and 1.9 percent overcharges on small LCD panel prices.[70]

63. The industry analysis also has implications for other steps in the damages analysis, including the issue of pass-through of overcharges on LCD panels. The LCD industry is characterized by complex supply chains, with LCD panels manufactured at one level, and then sold to firms that add value to LCD panels to transform them into a variety of finished LCD products.[71] These finished LCD products are then acquired by distributors or retailers that sell these products to end users. These latter stages in the supply chain may also add value, but do not fundamentally transform the LCD panel. Nonetheless, the transformation of LCD panels into finished LCD products results in differentiated products rapidly introduced into the market. Demand for products may change over the product cycle, as new innovative products are introduced. As Prof. Levinsohn and I will explain below, the analysis of damages must isolate the effect of any overcharge on the price of finished LCD products from factors related to demand for those products.

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[70] Carlton Expert Report, October 30, 2013, p. 12.

[71] Alternately, LCD panels may be transferred among affiliated business units.

64. Conditions such as changing shares and identities among competitors, rapid technological innovation, product differentiation, vertical integration and unstable demand would present substantial challenges to the effectiveness of a cartel. Prof. Bernheim's 18.9 percent average overcharge rate for large LCD panels and 25.5 percent for small LCD panels, and Prof. Blair's 15.3 percent overcharge rate for mobile phone handset panels, are not consistent with the conditions of the LCD panel industry.[72] Prof. Bernheim cites extensively to documents reflecting efforts to fix LCD panel prices, but does not analyze how the defendant conspirators would have maintained adherence to his estimated average overcharges in the actual context of these industry factors. Although Prof. Marx emphasizes the importance of allocation structures and enforcement structures sufficient to withstand the harsh climate for a cartel in the LCD panel industry, neither she nor Prof. Bernheim identify such structures in the LCD industry.[73] Instead, unlike Prof. Marx, Prof. Bernheim argues that these factors are not relevant to expectations about the effectiveness of the cartel. Prof. Blair similarly offers no evaluation of whether and how adherence to significant average overcharges would be maintained in the market for small panels.[74]

III. OVERVIEW OF PASS-THROUGH AND DAMAGES

65. In the sections that follow, we explain the economics of how firms' prices adapt to changes in costs, how we econometrically estimate these relationships, and how we use these estimates to calculate damages. One goal in those sections is to be careful and precise; that often requires graphs and equations. In this section, we step back and present the core economic concepts at a more intuitive level and we relate these concepts to the plaintiffs'

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[72] Bernheim Circuit City Report, June 6, 2013, ¶175; Blair Declaration, June 6, 2013, ¶53.

[73] I note that in his extensive review of documents and communications among the alleged conspirators in this matter, Professor Bernheim does not identify evidence of an effort to collude on the price of finished products. Similarly, I note that the evidence cited by Professor Bernheim in his description of the alleged efforts to fix prices is limited and episodic for small panels.

[74] Blair Declaration, June 6, 2013. Professor Blair does not provide any evidence of an enforcement mechanism with regard to small panels sufficient to achieve the overcharges he estimates.

experts' reports as well as to our own damages analysis. In short, this section presents the narrative.

66. In general, a seller has an incentive to pass higher costs on to its customers by increasing prices. If a seller does not increase prices when the cost of supplying a product goes up, its profit margins fall. Here, if the alleged conspiracy elevated LCD panel prices, LCD product manufacturers might have charged their customers higher prices. These customers, in turn, might have then charged their customers higher prices and so on until the LCD product reached the end-consumer. Each entity in the supply chain between the panel manufacturers and the end consumers might have charged its customers more because of the higher LCD panel prices. The extent to which a firm faced with higher costs then charged higher prices is what economists refer to as pass-through. If higher costs translated, penny for penny, into higher prices, then pass-through would be 100 percent. If a dollar increase in cost resulted in a price increase of, say, 80 cents, then pass-through would be 80 percent.

67. In the cases that we address in this report, pass-through matters because each plaintiff lies somewhere in the middle of the LCD supply chain.

68. Based on our understanding of the legal framework, we will refer to two types of purchases. If a plaintiff bought an LCD panel or product from an alleged conspirator or company allegedly related to an alleged conspirator, we will refer to that purchase as a *direct purchase*.[75] This is in contrast to when a plaintiff bought an LCD panel or product from some other company. We will refer to the purchase of that product as an *indirect purchase*. A purchase from Samsung, for example, is a direct purchase; a purchase from Hewlett Packard is an indirect purchase. We understand that whether particular companies are alleged conspirators or related to alleged conspirators is subject to disagreement among the parties. Such disagreements are not relevant to our conceptual discussion in this section.

[75] We understand that there may be a legal dispute as to whether a purchase from an alleged conspirator of a finished product that contains an LCD panel constitutes a "direct purchase," for purposes of antitrust law. We have no opinion on this legal dispute.

69. As a matter of economics, pass-through is relevant to both direct and indirect purchases. When a plaintiff, for example, buys a laptop containing an LCD panel and that panel was originally sold at an artificially elevated price (an "overcharge") due to the alleged conspiracy, then the laptop price may reflect the higher LCD panel price. We will sometimes refer to this as "upstream pass-through." The plaintiff then sells the laptop and may pass on any of the LCD panel overcharge by raising the price that it charges for the laptop. We will sometimes refer to this as "downstream pass-through." This economic logic applies to both direct and indirect purchases. Our understanding though is that the law may prohibit considering pass-through on direct purchases when calculating damages.[76] For indirect purchases, our understanding of the law is that pass-through may be considered.

70. If the downstream pass-through rate is 100 percent (or greater) there are no damages on indirect purchases, regardless of the overcharge, upstream pass-through, or volume of commerce. If, however, the downstream pass-through rate is less than 100 percent, damages on indirect purchases are determined by the combination of the overcharge, upstream pass-through, downstream pass-through, and volume of commerce.

71. Economic theory has strong predictions about pass-through rates when markets are what economists term "perfectly competitive." In markets that are perfectly competitive, many firms sell an identical product and no single firm can affect the market price of that product. In these circumstances, the pass-through rate is 100 percent. The intuition behind this bright-line prediction is straightforward. Consider the choices facing a firm that just experienced a market-wide cost increase in a perfectly competitive market. If the firm tries to pass through more than the actual cost increase, that firm would charge a price higher than that of its many competitors, each of which is selling the identical good. That firm would see its sales plummet. On the other hand, what if that firm were to absorb some of

[76] We understand that there is a legal dispute as to whether certain purchases are nonetheless subject to the Sherman Act and, therefore, the bar on consideration of pass-through. We do not offer an opinion on this legal dispute, though we understand that some of our economic analysis may be used as evidence in such a dispute.

the cost increase in order to gain an edge over the competition? In a perfectly competitive market this is also a recipe for disaster. In such a market firms just break even – that is, the prices they charge allow them to just cover their costs. Consequently, absorbing some of a cost increase would result in selling products at a loss.

72. Very few markets are exactly perfectly competitive, but some are much closer than others. As we note above, in a perfectly competitive market many firms sell exactly the same product and no single firm can affect the market price of that product. This stylized description fits some parts of the LCD supply chain better than others:

i. **Product makers**, including one plaintiff (Syntax Brillian), as well as more widely known companies such as Apple and HP, produce their own products using LCD panels. These products will tend to have some brand identity; they will be "differentiated." An Apple laptop, for example, is meaningfully different from an HP laptop. Consequently, it would not be surprising if product makers' average pass-through rates are different from the average pass-through rate predicted in perfectly competitive markets.

ii. **Retailers** are another group of plaintiffs (e.g., Circuit City, Office Depot, and P.C. Richard). The retail consumer electronics industry is perhaps not perfectly competitive. Retailers have some brand awareness and slightly different business models. But it is nevertheless quite competitive and so it would not be surprising if retailers' average pass-through rates are closer to 100 percent than are product makers' average pass-through rates.

iii. In the middle of the supply chain are **distributors**. Distributors act as the "middle man" and get the product from the manufacturers (whose name may be on the label) to the retailer (whose name is above the door through which the consumer walks). Distributors are unlikely to have brand identity and tend not to be very different from each other. This is the link in the LCD supply chain that is the most likely to be characterized by something close to perfect competition.

73. While economic theory makes clear predictions about pass-through when markets are perfectly competitive, theory is less definitive when markets are not perfectly competitive. In markets where firms have what economists term "pricing power" (e.g., they don't passively accept the market price but rather recognize that they can influence that price), pass-through may deviate from 100 percent. But just how it deviates depends on a number of variables. In these situations economists would not be surprised to learn that pass-through is either greater than or less than 100 percent. Thus, in markets that are not perfectly competitive, firms may absorb a portion of a cost increase or may raise price by an amount that is even larger than the cost increase. It is truly an empirical question—pass-through in these situations cannot simply be predicted based on economic modeling, but must be estimated using actual data.

74. Estimating average pass-through in the LCD industry is not, as econometric applications go, particularly complicated. There are some potential pitfalls, however. The core concept of estimating pass-through is to measure the change in price resulting from a change in cost when only cost has changed. As a thought experiment, one could imagine a (completely fictional) laboratory setting in which a company's product was "shocked" with a cost increase and one would observe how that firm adjusted the price of its product. That change would measure pass-through. In the hypothetical lab, one can isolate the cost "shock" and safely infer that the responding change in price captures pass-through. But that is not the case here. Instead, we observe prices and costs from actual market data, not the result of some lab experiment.

75. Unlike the data generated by the hypothetical lab experiment, actual market data reflect more than just changes in costs (which underlie pass-through); they also reflect changes in demand. An example illustrates the idea. The demand for a particular LCD notebook computer falls over time. It is a familiar pattern for many consumer electronics. A new model enters the market and is state-of-the-art. Over time other notebook computers appear and what was once the hot item ends up in the bargain bin. Over the course of the notebook's life cycle, its price drops due to changes in demand; consumers are generally less

willing to pay a higher price for a notebook that has been on the market for two years than they are for a notebook that has just been introduced to the market. This is quite different from the change in cost that underlies the concept of pass-through. If the econometrician is not careful, it is easy to conflate the price effects of changes in cost and the price effects of changes in demand. In our thought experiment, we change only cost and then observe the resulting change in price. In actual data, costs and demand are both changing and it is necessary to separate out these effects to estimate pass-through. Otherwise, estimates of "pass-through" are in fact estimates of the net impact on price of changes in cost and demand.

76. We have data on products that — at any given point in time — cost different amounts to make or acquire. Using these data, we can estimate the extent to which cost differences result in price differences. We also have data on products that — at different points in time — cost different amounts to make or acquire. Using these data, we can estimate the extent to which cost changes result in price changes.

77. Each type of variation carries with it the cost changes that enable the estimation of pass-through as well as the demand changes that, unless accounted for, will bias the estimation of pass-through.

78. Consider first the variation in prices and costs across products. Even within a class of LCD products, say laptops, there is significant quality variation. LCD products are "differentiated" in terms of quality. Higher quality laptops are priced higher for two reasons: 1) they are more expensive to make; and 2) consumer demand for them is stronger. In studying pass-through, it is necessary to separate the differences in prices that result from differences in cost from the differences in prices that result from differences in demand. The differences in prices that result from differences in costs represent pass-through. The differences in prices that result from differences in demand do not. Failure to account (or "control") for differences in demand will result in attributing to cost what are actually the effects of both cost and demand.

79. A similar issue arises with the time-series variation in prices and costs for specific products. Over a product's life cycle price tends to fall for two reasons: 1) the cost of making the product declines as production techniques improve; and 2) consumer demand for that product declines as newer products are introduced. Again, in studying pass-through it is necessary to separate the changes in prices that result from changes in costs from the changes in prices that result from changes in demand.

80. We estimate pass-through rates at each level of the LCD product supply chain using an econometric model that accounts for differences in demand across products and changes in demand for products over time. If, however, one disagrees with the relevance of accounting for demand-side factors — as some of the plaintiffs' experts do — then demand-side factors should be ignored when estimating pass-through at each level of the LCD product supply chain. Accounting for demand-side factors becomes less important as the market in question approaches perfect competition. At the extreme, it would be economically defensible not to control for demand factors if one somehow knew, *with complete certainty*, that a particular market was perfectly competitive. In that case pass-through would be 100 percent. But as a practical matter, it is unclear how one could possibly know that a market is exactly perfectly competitive. For this reason we believe that data permitting it is sound economics to always control for demand-side factors when estimating pass-through.[77] Our knowledge of the supply chain for LCD products though leads us to believe that some levels are likely to be more competitive than others. (This is quite different from saying that any particular level of the supply chain is definitely perfectly competitive.) For example, the conditions characterizing perfect competition are less likely to apply to LCD product manufacturers than to distributors or retailers of these products. Hence, while data permitting it is sound economics to control for demand-side factors in the estimation of pass-through at all levels of the supply chain, it is especially important to do so at the top. It would be wrong and would get the economics exactly backwards to include demand-side factors in the estimation at the bottom of the supply chain and not at the top.

[77] We explain in Section V, for example, that it may be necessary to adjust the approach to pass-through estimation when the available data have significant measurement error.

81. Estimating pass-through requires data on prices and costs and estimating pass-through along the supply chain requires data at the different levels of that chain—product manufacturers, distributors, and retailers. It does not, though, require data from each and every seller. This is because average pass-through is largely a market phenomenon, a point on which we and Prof. Bernheim and Prof. Marx agree.[78,79]

82. The plaintiffs, defendants, and third parties have produced transaction-level prices and costs. In some cases, transaction-level prices and costs are provided together by the supplier of the data. This is helpful because it means we observe exactly how much a product cost to obtain and how much that same product sold for. In these data, there is little reason to be concerned about what econometricians term "measurement error." In lay-terms, these are great data. In other cases, though, the information on prices and on costs have not been provided together; prices are provided in one transaction-level dataset (a "sales data" file) and costs in another transaction-level dataset (a "purchases data" file). The econometrician can try to match the costs from one database to prices from another database, but this will inevitably be imprecise. He/she has no way to determine how much a seller paid for a product that it sold in any given transaction. Based on the sales data, for example, the econometrician may know that a seller sold a product on a specific date, but he/she cannot determine when the seller acquired the product, and so cannot determine using the purchases data how much the seller paid for the product. The econometrician can make judgment calls (assumptions) about the timing between purchases and sales, but this will

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78 "To a great extent, the rate of pass-through is a characteristic of the *market* rather than of the individual firm. This is because pass-through is driven by the nature of demand, technology, and the degree of competition between the firms that populate the industry. Thus, one can draw reasonable inferences concerning the likely rate of pass-through for a given firm by measuring pass-through rates for the firms with which it competes. Even when data for a given firm are available, there is a trade-off between relying on the estimated pass-through rate for the firm in question, versus the average pass-through rate for the industry, which may be more representative of general industry dynamics and less susceptible to the influence of idiosyncratic events." Bernheim Circuit City Report, June 13, 2013, ¶223.

79 "That's correct. And that's consistent with the way economists think about the pass-through rate as a feature of an industry. Particularly, a pass-through rate for an industrywide, as would be appropriate in this case, a pass-through rate for an industrywide change in the underlying cost." Marx Deposition, October 9, 2013, p. 124:1-7.

inevitably result in mistakes, and these mistakes will compromise the accuracy of the pass-through estimates.

83. If data have significant measurement error, it is important to adjust the econometric approach accordingly. It can be done, but it involves compromises, and these compromises can be costly—adjusting the econometric approach to address measurement error may introduce other problems that reduce the accuracy of the estimates. Thus, it is preferable to avoid such compromises in the first place by using "matched" data (i.e., price and cost data provided together by the supplier of the data). Fortunately, matched data are available at nearly every level of the supply chain.[80] We use these data and avoid the need to make the compromises necessary in the presence of unmatched data.[81,82]

84. We estimate pass-through rates for LCD product manufacturers, LCD product distributors, wireless carriers, and LCD product retailers. We use these estimated pass-through rates to determine the extent to which any overcharge would have caused each plaintiff to have paid more and then to have charged more because of the alleged conspiracy.

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[80] Note that no data for LCD product assemblers are available, matched or unmatched.

[81] Prof. Bernheim takes the same approach in his analyses of pass-through that rely on within-product cost variation: "I restricted this analysis to companies for which prices and costs are available from the same data source. I impose this restriction because, for this mode of analysis, it is important to ensure a close match between the products for which prices and costs are measured. Using different data sources raises the possibility that the two data sources may be imperfectly synchronized, in which case the prices and costs may refer to products produced at different points in time. Because this method exploits within-product covariation between prices and costs over time, the analysis is potentially sensitive to the quality of data synchronization. In my judgment, it is better to rely on data sources that purport to measure prices and costs for the same units. I therefore only included data that provided price and the corresponding cost information from the same source." Bernheim Circuit City Report, June 13, 2013, ¶249.

[82] Prof. Marx also agrees with this approach.

> Q. Do you agree with Dr. Bernheim, that given a measurement error associated with unmatched purchase and sales data, that in this case it's better to use only matched price data to calculate pass-on when using a longitudinal analysis? A. I thought he made a reasonable choice there given the roles of the analysis and the challenged posed by the data. Q. So you agree with him, correct? A. I agree with the choice he made here, yes. Marx Deposition, October 9, 2013, pp. 118:25-119:11.

85. We have reviewed the pass-through analyses offered by the plaintiffs' experts. These are addressed in some detail below but we summarize our review here. The task of the econometrician is to adopt the specification that is most likely to provide accurate estimates of average pass-through. As we will explain, in our opinion, the plaintiffs' experts have not done so. Their methods are not the most likely to provide accurate estimates of average pass-through.

86. Prof. Bernheim measures the combined effect of demand changes and cost changes on prices and he calls this cost pass-through. It is not. By not controlling for the impacts of demand on prices, Prof. Bernheim tends to over-estimate cost pass-through by LCD product manufacturers. Prof. Bernheim estimates what he calls cost pass-through using eight different "specifications."[83] A specification is a particular equation that is applied to the data. None of his specifications adequately controls for demand influences. Prof. Bernheim notes that nearly all his specifications yield pass-through rates in excess of 100 percent. We interpret this apparent consistency as reflecting a consistent flaw in each of Prof. Bernheim's eight specifications. That said, we note that if one uses Prof. Bernheim's specifications to estimate pass-through by LCD product distributors and retailers as well as LCD product manufacturers, the estimates of pass-through throughout the LCD supply chain are almost always above 100 percent, implying little to no indirect damages for plaintiffs.[84]

87. Dr. Snow's analysis of pass-through is baffling.[85] Dr. Snow was instructed to assume 100 percent pass-through by an LCD product assembler and then to consider whether there is evidence consistent with the assumption of 100 percent pass-through. This is akin to deciding the butler did it and then looking for clues consistent with this decision. In our opinion, receiving an instruction from counsel to assume 100 percent pass-through and then looking for evidence in an attempt to validate this instruction is quite misguided and economically indefensible.

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[83] Prof. Bernheim's report is discussed in more detail in Section VI.B.

[84] See Appendix E.

[85] Dr. Snow's report is discussed in more detail in Section VI.D.

88. Prof. Marx, like Dr. Snow, never actually estimates pass-through.[86] Prof. Marx makes a theoretical argument that LCD product distributor pass-through must have been 100 percent. We too would expect LCD product distributor pass-through to be close to 100 percent. Economic theory, though, only takes one so far. It wouldn't surprise us if LCD product distributor pass-through was 90 percent, 95 percent, or 102 percent. This is why it's important to estimate pass-through if the data are available. And in this instance, the data are there and we use them. Prof. Marx, inexplicably, does not use those data and appears not to be aware that such data are even available.[87]

89. Prof. Blair also conducts analyses of pass-through, first estimating what he calls cost pass-through by mobile phone handset manufacturers to a wireless carrier, TracFone ("upstream" pass-through), and then what he calls cost pass-through by TracFone ("downstream" pass-through).[88] Somewhat remarkably, he estimates a pass-through rate of 179 percent by handset manufacturers to TracFone and a pass-through rate of 21 percent by TracFone. That is, Prof. Blair claims that 179 percent of any overcharge would have reached TracFone, and then claims that almost 80 percent of that would have been absorbed by TracFone.

90. Prof. Blair's estimates of pass-through do not make sense. Using one econometric specification, Prof. Blair severely overestimates pass-through by handset manufacturers to TracFone. And then using a different econometric specification, Prof. Blair severely

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[86] Prof. Marx's report is discussed in more detail in Section VI.C.

[87] Marx Deposition, October 9, 2013, p. 157:8-15.

> A. I'm not sure I had distributor data available to me. And, for example, if we look at BrandsMart, it was .5 percent, a half a percent, of their purchases. And so I – I felt strongly that my conclusion of a hundred percent pass-through being the appropriate pass-through rate for these distributor sales, that that was reliable given the work that I had done.

[88] Prof. Blair's Declaration is discussed in more detail in Section VI.D.

underestimates pass-through by TracFone. Each specification is incorrect and the specifications applied together are internally inconsistent.[89]

91. With regard to pass-through to TracFone, like Prof. Bernheim, Prof. Blair measures the combined effect of demand changes and cost changes on handset manufacturer prices and calls this cost pass-through. Prof. Blair, though, also commits another more fundamental error. Whereas Prof. Bernheim looked at how product price varied with product cost, Prof. Blair looks at how product price varied with *panel* cost. A hypothetical example illustrates the problem. Suppose a phone had only two components, the LCD panel and another component we'll call EE for Everything Else. Suppose the panel price went up by $1 and the price of EE also rose by $1, and in response, the price of the phone rose by $2. This would be an example of the cost increase translating penny for penny into a price increase or 100 percent pass-through. By examining only the panel and ignoring EE, Prof. Blair would observe cost increasing by $1 and price increasing by $2 or pass-through of 200 percent. This approach is just plain wrong. The net result is that Prof. Blair severely over-estimates pass-through to TracFone.

92. Prof. Blair's errors do not end there though. With regard to pass-through by TracFone, Prof. Blair uses data plagued by measurement error, but does not adjust his econometric specification appropriately, and he makes some straightforward coding errors in his handling of the data.[90] The net result is that Prof. Blair severely underestimates pass-through by TracFone.

93. Computing damages requires applying the pass-through rates discussed above to estimates of the relevant volume of commerce and the extent to which the original prices of the LCD panels were inflated by the alleged conspiracy (the "overcharge"). We understand that Prof. Dennis Carlton estimates that LCD panel overcharges are 0.4 percent for large panels

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[89] Prof. Blair uses variation in panel cost and ignores variation in the costs of other components used to manufacture handsets to estimate pass-through by handset manufacturers to TracFone. Prof. Blair then uses variation in total handset cost to estimate pass-through by TracFone.

[90] See in particular ¶¶216-240 of this report.

and 1.9 percent for small panels.[91] We have been instructed by counsel to use Prof. Carlton's overcharge estimates to estimate damages. We report our damages estimates in Exhibit III.1. We have also been instructed by counsel to estimate damages using Prof. Bernheim's overcharge estimates. We report these damages estimates in Appendix E.

IV. THE ECONOMICS OF PASS-THROUGH

A. Overview

94. In this section we discuss the economics of pass-through. We explain that economic theory predicts that the pass-through rate converges to 100 percent as a market becomes more competitive (i.e., as the pricing power of a seller decreases). We also explain why economic theory predicts that pass-through by LCD product manufacturers may be less than or greater than 100 percent, and why pass-through by LCD product distributors and retailers will tend to be close to 100 percent.

B. Predictions of Economic Theory about Competition and Pass-Through

95. According to economic theory, the price that a seller charges for a product depends on the seller's cost of making or acquiring the product, "the demand" for the product, and the nature of competition in the relevant market.

96. Economists use the term "elasticity" to describe the sensitivity of quantity demanded to price. Demand is said to be "elastic" if a one percent increase in price results in a greater than one percent decrease in quantity demanded; demand is said to be inelastic if a one percent increase in price results in a less than one percent decrease in quantity demanded.

97. The extent to which there are close substitutes for a product affects the elasticity of its demand. If there are close substitutes, the elasticity will be higher (in absolute value); if not, it will be lower (in absolute value).

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[91] Expert Report of Dennis Carlton, Ph.D., *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, This Document Relates to Track 2 Cases, No. 3:07-md-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, October 29, 2013, p. 12.

98. When a market is "imperfectly competitive" (e.g., monopoly or a market with products that are close (but not perfect) substitutes), economic theory posits that the pass-through rate may be less than 100 percent, equal to 100 percent, or greater than 100 percent.[92] As competition increases, the pass-through rate is predicted to converge to 100 percent. Because firms no longer have market power, they cannot price above marginal cost, and so they pass on 100 percent of any changes in cost.[93]

99. Figure IV.1, below, illustrates these theoretical relationships graphically.[94] The blue curves show how the pass-through rate changes as competition increases (i.e., as market power decreases) when demand is "log convex."[95] The red curves show how the pass-through rate changes as competition increases when demand is "log concave."[96,97] Linear demand is a

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[92] A pass-through rate that is greater than 100 percent indicates that a change in cost of $x results in a change in price that is greater than $x; for example, a pass-through rate of 110 percent indicates that a $1 increase in cost results in a $1.10 increase in price.

[93] Weyl, E. Glen, and Michal Fabinger, "Pass-Through as an Economic Tool: Principles of Incidence under Imperfect Competition," forthcoming in the *Journal of Political Economy*, Vol. 121(3), February 24, 2013; Fabinger, Michal, and E. Glen Weyl, "Pass-Through and Demand Forms," *SSRN*, December 30, 2012, http://ssrn.com/abstract=2194855.

[94] The competitiveness of a market is often described in the economics literature by an index called a "conduct parameter." See, for example, Bresnahan, Timothy, "Empirical Studies of Industries with Market Power," *Handbook of Industrial Organization*, 1989, pp. 1011-1057. In theory, the pass-through rate is a function of the log-concavity of demand and the conduct parameter. Figure IV.1 shows the pass-through rates for given demand functions and prices as the conduct parameter varies from monopoly to perfect competition.

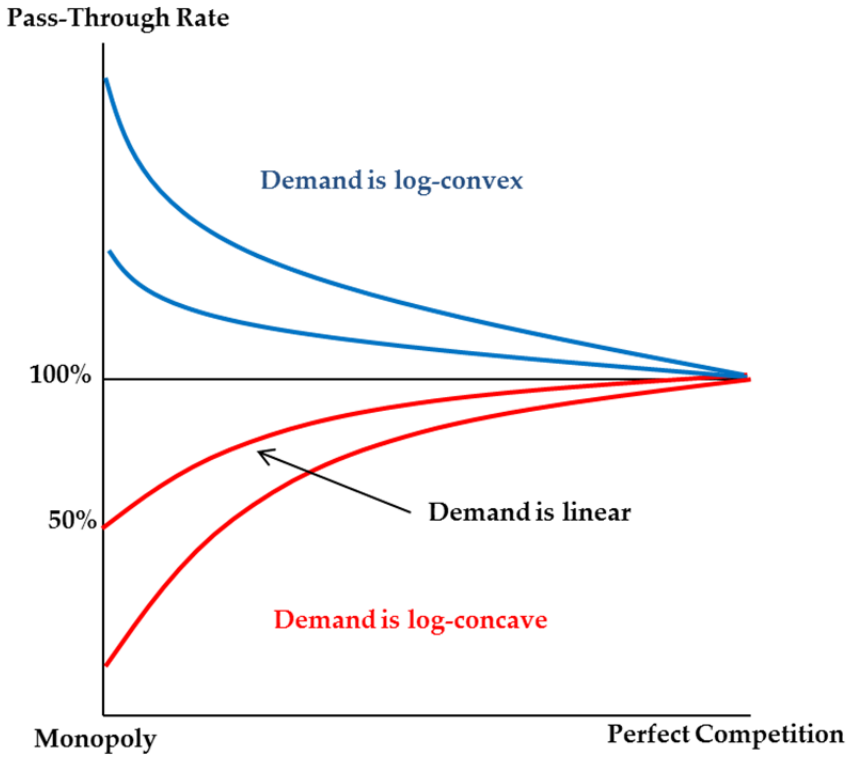
[95] Log convexity is a form of demand curvature. A function $f(x)$ is considered "convex" if the slope of the function is increasing in x. A function is considered "log convex" if the natural log of the function is convex.

[96] Log concavity is a form of demand curvature. A function $f(x)$ is considered "concave" if the slope of the function is decreasing in x. A function is considered "log concave" if the natural log of the function is concave.

[97] Demand curvature (i.e., the extent to which demand is log convex or log concave) is relevant to pass-through for the following reason. A cost increase causes a supplier to set price on a different part of the demand curve. Depending on the shape of the demand curve, the supplier sets price on a part of the curve where demand is more sensitive to price. This constrains pass-through. The extent to which the demand that the supplier faces is log convex or log concave determines the extent to which the sensitivity of demand changes along the demand curve. When demand is log concave, a cost increase moves a supplier to a part of the demand where demand is much more sensitive to price. When demand is log convex, a cost increase moves the supplier to a part of the demand curve where

special case of log concave demand. When demand is linear, the pass-through rate is 50 percent for a monopoly and increases to 100 percent as the competiveness of the market increases (i.e., as market power decreases). No matter what the curvature of demand, the pass-through rate is predicted to converge to 100 percent as the competitiveness of the market increases (i.e., as market power decreases).[98]

Figure IV.1
The Theoretical Relationship between Pass-Through and Competition



demand is more sensitive to price, but the change in the sensitivity of demand is smaller than when demand is log concave.

[98] Weyl, E. Glen, and Michal Fabinger, "Pass-Through as an Economic Tool: Principles of Incidence under Imperfect Competition," forthcoming in the *Journal of Political Economy*, Vol. 121(3), February 24, 2013; Fabinger, Michal, and E. Glen Weyl, "Pass-Through and Demand Forms," *SSRN*, December 30, 2012, http://ssrn.com/abstract=2194855.

C. Predictions of Economic Theory about Pass-Through along the Supply Chain for LCD Products

100. The discussion in the previous section has implications for the pass-through rates that economic theory predicts would be observed along the supply chain for LCD products. LCD product manufacturers develop innovative products (i.e., they sell products that are differentiated), and so they have some pricing power. Distributors are much less differentiated, if at all, and so they have little to no pricing power; distributors do not develop innovative products, but rather purchase and sell them. Retailers differentiate themselves to some extent through advertising and service, and likely have more pricing power than distributors, but less than manufacturers. Thus, economic theory predicts that LCD product manufacturer pass-through may be less than or greater than 100 percent; LCD product distributor pass-through will tend to be close to 100 percent; and LCD product retailer pass-through may be less than or greater than 100 percent, but will tend toward 100 percent.

V. THE EMPIRICAL ANALYSIS OF PASS-THROUGH

A. Overview

101. In the previous section we discussed pass-through from the perspective of economic theory. While economic theory provides a useful foundation for thinking about pass-through, it is a complement to and not a substitute for empirical analysis. Actual pass-through is an empirical issue.

102. In this section we discuss the empirical analysis of pass-through. We explain that such an analysis needs to account for two widely understood and recognized features of LCD products: "quality differentiation" and "product life cycles." We also explain why an empirical analysis of pass-through requires reliable data on prices and costs. We describe four econometric specifications, discuss their tradeoffs, and describe our preferred approach.

103. Broadly defined, econometrics is the use of statistics and data to make inferences about economic relationships. An econometric specification is an equation that describes one variable (the "dependent variable") as a function of one or more other variables (the "explanatory variables"). Consider, for example, the following linear equation:

$$Y = a + b*X + c*Z + e$$

The variable Y is termed the "dependent variable." The variables X and Z are termed the "explanatory variables." The term e is called the "error term" or "disturbance term." It contains all factors other than X and Z that affect the dependent variable Y. The constants a, b, and c are the "parameters" of the equation, and they describe the directions and magnitudes of the relationships between the dependent variable Y and the explanatory variables X and Z. The parameter, b, for example, describes the effect of a one-unit change in the explanatory variable X, holding constant the value of the explanatory variable Z. Similarly, the parameter, c, describes the effect of a one-unit change in the explanatory variable Z, holding constant the value of the explanatory variable X. In the equation above, the relationship between the dependent variable Y and the two explanatory variables X and

Z is assumed to be linear, which means that a one-unit change in either variable always results in a change in the dependent variable of *b* or *c*. Given the econometric specification, the econometrician estimates the parameters of the equation by "running" a regression of *Y* on *X* and *Z*.

B. Pass-Through Estimation, Quality Differentiation, Product Life Cycles, and Measurement Error

104. In the simplest case, pass-through can be estimated econometrically by running a linear regression of the price of product *i* in period *t*, P_{it}, on the cost of product *i* in period *t*, C_{it}.[99] The estimating equation in this case is given by:

(1) $$P_{it} = \alpha + \beta * C_{it} + e_{it}$$

105. In equation 1, the estimate of pass-through is β and e_{it} represents all unmodeled factors that affect price other than cost. For the estimate of β to be unbiased, e_{it} must be uncorrelated with the included regressor C_{it} – the cost of the product.

106. For LCD products, there are two important reasons why cost might be correlated with the error term in equation 1. The first applies to the cross-sectional variation in the data; that is, how product quality at a given point in time varies across products. The second applies to the time-series variation in the data; that is, how a given product's price and cost vary at different points over time. We discuss each in turn.

i. The econometrician needs to control for quality differentiation to estimate pass-through

107. Like many "high-tech" products, some LCD products are higher "quality" than others. A laptop, for example, with more memory, a larger hard drive, and a faster microprocessor is

[99] Here and in what follows below, we assume that data are available on the prices and costs of *I* products that are produced and sold over a maximum of *T* periods, where the price of product *i*, $i \in \{1,2,\ldots,I\}$, at period *t*, $t \in \{1,2,\ldots,T\}$, is denoted as P_{it} and the corresponding cost is denoted as C_{it}.

considered to be higher quality than a laptop with less memory, a smaller hard drive, and a slower microprocessor.[100]

108. Some of the effect of product quality on price operates through the relationship between quality and cost. Higher quality products typically cost more to produce or acquire, and, to a certain extent, their prices reflect this. But some of the effect of product quality on price can be distinct from the relationship between quality and cost. This means that higher quality products may be priced at higher mark-ups than lower quality products.[101,102] In

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[100] Deposition of Erik Willey, Viewsonic 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:12-cv-0335-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, January 16, 2013 (hereafter "Willey Viewsonic Deposition, January 16, 2013"), p. 26:1-10.

> Q. So the larger displays were considered -- when you say "higher-end," are you just referring to the size or are you referring to the quality of the product? A. Typically the larger displays would have a higher resolution, especially in that time period, and in addition, would have several extra types of features built into the completed product, which made them more technically advanced than the monitor displays.

[101] Willey Viewsonic Deposition, January 16, 2013, p. 170:9-20.

> Q. Do you know whether higher-end products were marked up by a higher dollar amount than lower-end products? A. Yes, the higher -- more professional-grade products tended to be -- have a higher markup than the entry-level products. Q. And along those lines, were higher-end products marked up at a higher percentage of their cost than lower-end products? A. Typically they would be marked up at a higher percent as well, yes.

[102] One form of price discrimination occurs when a firm with market power sells different versions of a given product to take advantage of differences in consumers' willingness to pay for product quality. Firms offer a menu of products and prices, each of which is targeted toward a specific type of consumer, where the products are designed in a way that makes it optimal for consumers of each type to choose the product that is designed for them. See, for example, Jean Tirole, *The Theory of Industrial Organization*, The MIT Press, Cambridge, 1997, pp. 142-143, 149-150.

Mussa and Rosen (1978), for example, show how a monopolist can extract higher profit margins from consumers with a higher willingness to pay for quality by offering a wide product line of price-quality combinations. Mussa, Michael, and Sherwin Rosen, "Monopoly and Product Quality," *Journal of Economic Theory*, Vol. 18(2), 1978, pp. 301-317.

Deltas et al. (2011), for example, find (i) that computer prices are higher for a firm's "flagship" products (highest speed computers), even after accounting for the direct effect of higher performance on price; (ii) that for computers with any particular computer chip, prices are systematically higher the closer the computers are to the firm's "frontier," meaning that they are the highest-end product of a firm's product line; and (iii) that firms earn rents for their high quality products, while prices for products of lower quality are nearly perfectly competitive, meaning that competition is stronger for low rank/quality products than for high quality products. Deltas, George, Thanasis Stengos, and

many instances, for example, the purchasers of higher quality products tend to be less sensitive to price than the purchasers of lower quality products. Airline ticket pricing is an example. The purchasers of business class seats tend to be less price sensitive than the purchasers of economy class seats, and so business class seats are priced at higher mark-ups than economy class seats.

109. An implication of unmodeled quality differences is that the estimate of pass-through in equation 1 may reflect the pass-through rate *as well as* the relationship between product quality, cost, and price. This creates an "identification" problem. The econometrician cannot "identify" the pass-through rate using equation 1. He/she cannot isolate the effect of cost on price – which is the pass-through rate – from the effect of quality on price.

110. Figure V.1 illustrates this using a hypothetical example in which the econometrician has estimated a pass-through rate of 130 percent with equation 1.[103]

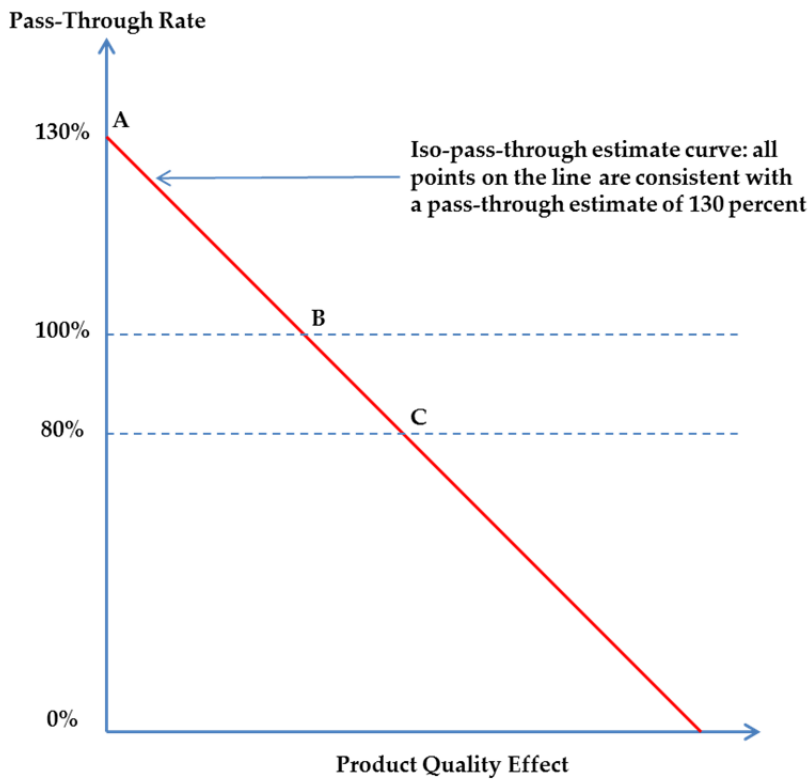
Eleftherios Zacharies, "Product Line Pricing in a Vertically Differentiated Oligopoly," *Canadian Journal of Economics*, Vol. 44(3), August 2011, pp. 907-929.

Shepard (1991), for example, finds that retail gas stations that offer both full-service (high-quality) and self-service (low quality) charge higher prices for full-service (high-quality) than full-service-only gas stations and lower prices for self-service (low quality) than self-service-only gas stations. This is consistent with price discrimination and profit margins that are higher for the high-quality product than the low-quality product. Shepard, Andrea, "Price Discrimination and Retail Configuration," *The Journal of Political Economy*, Vol. 99(1), February 1991, pp. 30-53.

Verboven (1999), for example, argues that cars with diesel engines can be considered to be of higher quality than cars that run on gasoline because of the lower cost of diesel fuel and favorable tax treatment, and finds that the higher quality product (diesel-engine cars) sell at higher margins than the lower quality products (gasoline-engine cars). (Frank Verboven, "Product Line Rivalry and Market Segmentation, with an Application to Automobile Optional Engine Pricing," *Journal of Industrial Economics*, Vol. 47(4), December 1999, pp. 399-425.)

[103] Appendix N presents a hypothetical example in which the econometrician has estimated a pass-through rate of 100 percent with equation 1.

Figure V.1
Illustration of Equation 1 Identification Problem



111. The vertical axis is the (unknown) pass-through rate (i.e., the true effect of cost on price). The horizontal axis is the (unknown) effect of product quality captured by the estimate of β in equation 1. The red iso-pass-through estimate curve shows the possible combinations of pass-through and product quality effect that could result in an estimate of 130 percent pass-through. Point A, for example, is the case in which the estimate of pass-through is equal to the pass-through rate (i.e., there is no product quality effect). Point B, alternatively, is the case in which the pass-through rate is 100 percent, and the estimate of 130 percent pass-through reflects the 100 percent pass-through plus a 30 percent product quality effect. Point C is the case in which the pass-through rate is 80 percent, and the estimate of 130 percent pass-through reflects the 80 percent pass-through plus a 50 percent product quality effect. The fundamental problem here is that the econometrician that estimates equation 1 has no

way to distinguish between the possible combinations of pass-through and product quality effect that lie on the iso-pass-through estimate curve.[104]

112. There is a straightforward solution to control for the effects of product quality that are unobserved by the econometrician and not already controlled for by observed cost. Including an indicator variable for each product, also termed a product fixed effect, will control for differences in quality across products that do not vary over time. This implies an estimating equation given by:

$$(2) \qquad P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + e_{it},$$

where P_{it} is the price of product i at calendar time t, C_{it} is the cost of product i at calendar time t, and δ_i is a product fixed effect.[105]

ii. The econometrician needs to control for product life cycles to estimate pass-through

113. Equation 2 controls for unobserved product quality, but may still yield biased estimates of pass-through. This is because changes in demand over time are not modeled in equations 1 or 2.

114. Like many high-tech products, LCD products have life cycles. Three important changes tend to occur over these life cycles. One, when a new LCD product is introduced, it is more likely to be state-of-the-art and it tends to be priced high.[106] As new and improved LCD products are subsequently introduced, the demand for the original product tends to

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[104] In more technical terms, an implication of quality differences across LCD products is that the error term e_{it} in equation 1 may be (positively) correlated with the included regressor C_{it} – the cost of the product. In the presence of unmodeled product quality that is positively correlated with product cost and mark-up, estimates of pass-through can be expected to be biased.

[105] The product-level fixed effect in equation 2 allows the intercept in the model to be different for every product, $i \in \{1,2,\ldots,I\}$.

[106] Deposition of Gregg Richard, P.C. Richard & Son Percipient, *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-cv-04119-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, January 24, 2013, p. 120:20-24.

> Q. And a new product that just comes out on to the market, a new LCD product, a particular product has its highest price when it first comes out on to the market? A. Yes.

fall.[107,108,109] Two, when a new LCD product is introduced, the type of customer purchasing the product is more likely to be an "early adopter" whose demand for the product is less price elastic.[110,111,112] Over the life cycle of the product, the type of customer purchasing the

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107 See, for example, Lou, Weifang, David Prentice, Xiangkang Yin, "What Difference Does Dynamics Make? The Case of Digital Cameras," *International Journal of Industrial Organization*, Vol. 30(1), January 2012, pp. 30-40, at p. 30. "New products entering into and old products retiring from markets is a prevailing phenomenon. It is more noticeable in markets where there is rapid technological change and product prices fall steeply and persistently. Examples of such markets include consumer electronics like personal computers, television sets, mobile phones, digital camcorders and digital cameras."

108 See, for example, Orbach, Barak Y., "The Durapolist Puzzle: Monopoly Power in Durable-Goods Markets," *Yale Journal on Regulation*, Vol. 21(1), Winter 2004, pp. 67-118, at p. 89. "In the real world … a declining price trajectory is a profitable and extremely ordinary strategy among durapolists. Many new products, like books and consumer electronics, are very expensive when they first appear on the market; over time, their prices decline. In many cases, prices go down with the appearance of newer products that undermine the appeal of older products."

109 Deposition of Jamie Columbus, Office Depot 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-cv-02225-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, January 24, 2013, pp. 135:3-137:18.

> Q. Okay. But once a product is on the market for a while, is one of the reasons the price often drops that consumers are not willing to pay as much for it? A. That would be one reason, yes. Q. Okay. Because once a product has been on the market for some time, there are often new substitutes that become available. Do you agree with that? A. For that exact product? Q. Yes. A. Yes. […] Q. And is another reason that the price for particular LCD product could fall over time, that it becomes less popular to consumers because of these newer, more advanced substitutes that have become available? A. Yes. That's -- yes.

110 See, for example, Pindyck, Robert S., and Daniel S. Rubinfeld, *Microeconomics*, *Seventh Edition*, Prentice Hall, 2008, p.403. "The objective of intertemporal price discrimination is to divide consumers into high-demand and low-demand groups by charging a price that is high at first but falls later. To see how this strategy works, think about how an electronics company might price new, technologically advanced equipment, such as high-performance digital cameras or LCD television monitors… The strategy, then, is to offer the product initially at the high price P_1, selling mostly to consumers [whose demand is less elastic]. Later, after this group of consumers has bought the product, the price is lowered to P_2, and sales are made to the larger group of consumers [for whom demand is more elastic]."

111 See, for example, Orbach, Barak Y., "The Durapolist Puzzle: Monopoly Power in Durable-Goods Markets," *Yale Journal on Regulation*, Vol. 21(1), Winter 2004, pp. 67-118, at pp. 89-90. "[T]he decline [in prices over time] constitutes intertemporal price discrimination: Early shoppers are charged more than late shoppers. Indeed, a declining price path may be a well-crafted strategy of durapolists rather than time-inconsistent behavior. When such a strategy is properly devised, the durapolist's profits are higher than under a regime of a constant monopoly price. A planned declining price trajectory, often referred to as *price skimming*, is based on price discrimination among consumers according to

product changes, and demand for the product becomes more price elastic.[113] This is another reason why the price of a given product tends to fall over the product life cycle. Three, when a new LCD product is introduced, it generally costs more to produce. As better production techniques are developed and product yields increase, costs tend to fall.[114]

115. Hence, over the product life cycle there are coincident decreases in product cost (due to, say, better production technology) and decreases in demand (due to, say, the introduction of more competing products). Patterns in the data illustrate this phenomenon.

116. Table V.1 shows the signs of the estimated partial correlations between LCD product manufacturer cost and quantity transacted controlling for fixed differences across products. For four of the six product types, the estimated correlation is positive; decreases in cost coincide with decreases in quantity transacted. This only makes sense if decreases in cost also coincide with decreases in demand. Firms tend to lower the price of a product when it

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their price-time sensitivity. Time-sensitive consumers are willing to pay premia to receive products immediately. Such consumers know that prices will decline but, nevertheless, are too impatient to postpone purchases. In contrast, price-sensitive consumers are unwilling to pay the premia charged early shoppers, so they delay purchases until prices are low. Recognizing the existence of different sets of consumers, a durapolist can maximize profits by pursuing a declining price path."

112 Deposition of Warren E. Mann, III, MARTA 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-cv-04119-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, December 18, 2012, p. 42:12-20.

> Q. […] and early adopters are less price sensitive than most consumers. Correct? A. I would agree. Q. So would you agree that that's one of the reasons why LCD products were more expensive in the beginning, is because they were primarily being purchased by early adopters? A. Yes. I think so.

113 Deposition of Robert Thompson, MARTA 30(b)(6) deposition, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-cv-04119-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, November 13, 2012, p. 226:17-25.

> Q. Okay. And generally, in MARTA's experience, those early adopters are not as price sensitive as the cost-conscious middle group; is that correct? A. Generally, yeah, right. Q. And the end of life, those purchasers are even more price sensitive than the middle group of the cost conscious; is that correct? A. Yes.

114 See, for example, Pindyck, Robert S., and Daniel S. Rubinfeld, *Microeconomics*, *Seventh Edition*, Prentice Hall, 2008, p. 403, footnote 9. "The prices of new electronics products also come down over time because costs fall as producers start to achieve greater scale economies and move down the learning curve. But even if costs did not fall, producers can make more money by setting high prices and then reducing them over time, thereby discriminating and capturing consumer surplus."

costs them less to produce it, and consumers tend to purchase more of a product when the price is lower. Thus, all else equal, lower costs should be associated in the data with higher quantities transacted. If lower quantities are transacted when costs are lower, the only plausible explanation is that demand for the product has decreased.[115,116]

[115] If decreases in cost are uncorrelated with decreases in demand, decreases in cost would result in decreases in price, and decreases in price would result in increases in quantity transacted.

[116] The converse is not true. If cost and quantity transacted are negatively correlated, it is not necessarily the case that cost and demand are uncorrelated. Large decreases in cost, for example, may lead to large decreases in price. And these decreases in price, in turn, may cause increases in quantity transacted *even if* demand has decreased. The estimated correlation between cost and quantity transacted is negative for two of the six product types in Table V.1. This does *not* indicate that cost and demand are uncorrelated for these product types.

Table V.1
Relationship Between LCD Product Manufacturer
Cost, Price, and Quantity Transacted

Application	Sign of Partial Correlation Between Cost and Price Controlling for Fixed Differences Between Products [A]	Sign of Partial Correlation Between Cost and Quantity Transacted Controlling for Fixed Differences Between Products [B]
Digital camcorders	Positive	Positive
Digital cameras	Positive	Positive
Mobile phones	Positive	Negative
Monitors	Positive	Positive
Notebooks	Positive	Negative
Televisions	Positive	Positive

Notes:
[1] LCD product manufacturers include Acer, Aopen, Bizcom, Dell, Envision, Funai, Lenovo, Motorola, Sony, and Westinghouse.
[2] The sign of the partial correlation between cost and price is determined by regressing price on cost and a product fixed effect.
[3] The sign of the partial correlation between cost and quantity transacted is determined by regressing quantity transacted on cost and a product fixed effect.
[4] The correlation coefficient between two variables is equal to the regression coefficient multiplied by the standard error of the independent variable and divided by the standard error of the dependent variable.
[5] Exhibit V.1 reports point estimates and standard errors.

Sources:
[1] Transaction data provided by third parties.
[2] Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph. D., June 13, 2013.

117. The pattern of decreases in cost coincident with weakening of demand has implications for the estimation of pass-through. Over the life cycle of a product, demand weakens, which leads to price decreases. This phenomenon shows up in equation 2 as a negative "shock" embodied in e_{it}. This weakening of demand coincides with—is correlated with—decreases in the cost of making the product. But in specifying equation 2, the econometrician assumes that the weakening of demand is uncorrelated with decreases in cost over the life cycle. This can result in overestimates of pass-through.

118. The effect of the product life cycle can be accounted for by controlling for the amount of time that a product has been on the market. This can be done by including what is termed a time-on-market fixed effect as an explanatory variable in the regression equation. The time-on-market fixed effect allows price to shift up or down depending on the amount of time that a product has been on the market. Hence, equation 2 becomes:

$$(3) \qquad P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \lambda_m + e_{it},$$

where P_{it} is the price of product i at calendar time t, C_{it} is the cost of product i at calendar time t, δ_i is the product-level fixed effect defined in equation 2, and λ_m is a time-on-market fixed effect.[117] Both δ_i and λ_m are parameters to be estimated in equation 3.

119. To illustrate that the time-on-market fixed effects control for weakening of demand over the product life cycle, it is useful to revisit the analysis summarized in Table V.1. The results in Table V.2 show that when time-on-market is controlled for, the relationship between cost and quantity transacted is negative for five of the six product types, as predicted by economic theory.[118]

[117] The time-on-market fixed effect allows the intercept in the model to change with the number of periods that a product is on the market.

[118] Televisions are the exception here. When time-on-market is controlled for, the estimated relationship between cost and quantity transacted is positive. This indicates that for televisions controlling for demand with time-on-market fixed effects does not fully control for the weakening of demand over the product life cycle. Note, however, that controlling for demand with time-on-market fixed effects partially controls for the weakening of demand. The estimated relationship between cost and quantity transacted is smaller (i.e., less positive) and is not significantly different from zero when time-on-market is controlled for. (See Exhibit V.1.)

Table V.2
Relationship Between LCD Product Manufacturer
Cost, Price, and Quantity Transacted Controlling for Time-On-Market

Application	Sign of Partial Correlation Between Cost and Price Controlling for Fixed Differences Between Products [A]	Sign of Partial Correlation Between Cost and Quantity Transacted Controlling for Fixed Differences Between Products [B]	Sign of Partial Correlation Between Cost and Price Controlling for Fixed Differences Between Products and Time-on-Market [C]	Sign of Partial Correlation Between Cost and Quantity Transacted Controlling for Fixed Differences Between Products and Time-on-Market [D]
Digital Camcorders	Positive	Positive	Positive	Negative
Digital Cameras	Positive	Positive	Positive	Negative
Mobile Phones	Positive	Negative	Positive	Negative
Monitors	Positive	Positive	Positive	Negative
Notebooks	Positive	Negative	Positive	Negative
Televisions	Positive	Positive	Positive	Positive

Notes:
[1] LCD product manufacturers include Acer, Aopen, Bizcom, Dell, Envision, Funai, Lenovo, Motorola, Sony, and Westinghouse.
[2] The sign of the partial correlation between cost and price reported in [A] is determined by regressing price on cost and a product fixed effect; the sign of the partial correlation between cost and price reported in [C] is determined by regressing price on cost, a product fixed effect, and a time-on-market fixed effect.
[3] The sign of the partial correlation between cost and quantity transacted reported in [B] is determined by regressing quantity transacted on cost and a product fixed effect; the sign of the partial correlation between cost and quantity transacted reported in [D] is determined by regressing quantity transacted on cost, a product fixed effect, and a time-on-market fixed effect.
[4] The correlation coefficient between two variables is equal to the regression coefficient multiplied by the standard error of the independent variable and divided by the standard error of the dependent variable.
[5] Exhibit V.1 reports point estimates and standard errors.

Sources:
[1] Transaction data provided by third parties.
[2] Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph. D., June 13, 2013.

120. Equation 3 controls for the amount of time that a product has been on the market with a time-on-market fixed effect. This approach is flexible along one dimension and potentially restrictive along another. It does not impose a specific functional form on the relationship between price and time-on-market,[119] but it restricts the effect of time-on-market to be the same for all products.

121. The extent to which demand falls over the product life cycle likely varies across products. For example, products that are more innovative may experience more substantial relative decreases in demand over their life cycles compared to products that are less innovative. One reason is that a more innovative product will typically be purchased early in the

[119] For example, it does not force the effect of time-on-market on price to be constant over time (i.e., to be linear).

product life cycle by "early adopters" who are less price elastic and then later in the product life cycle by "later adopters" who are more price elastic; a less innovative product will typically be purchased by "later adopters" who are more price elastic over the entire life cycle. Products that are more innovative may also experience more substantial decreases in cost over the life cycle compared to products that are less innovative. One reason is that the learning effects can be more substantial for the more innovative products compared to the less innovative products. An implication is that product-specific life cycle effects may not be fully controlled for by the common time-on-market fixed effect in equation 3.

122. In principle, restricting the effect of time-on-market to be the same for all products could be avoided by including a separate set of product-specific indicator variables for the amount of time a product has been on the market:

(4) $$P_{it} = \alpha + \beta * C_{it} + \delta_i + \lambda_{im} + e_{it},$$

where P_{it} is the price of product i at calendar time t, C_{it} is the cost of product i at calendar time t, δ_i is the product-level fixed effect defined in equation 2, and λ_{im} is a product-specific time-on-market fixed effect.[120]

123. As a practical matter, however, equation 4 cannot be estimated. The number of parameters that are required—the set of product-specific time-on-market parameters—is greater than the number of observations in the data.

124. Instead, the specification in equation 4 can be approximated by replacing the product-specific time-on-market parameters (i.e., the λ_{im}) with product-specific time-on-market trends:

(5) $$P_{it} = \alpha + \beta * C_{it} + \delta_i + \theta_i * M_{it} + e_{it}$$

125. In equation 5, the time-on-market trend is denoted by "M_{it}" and takes the value of the number of periods that the product has been on the market at calendar time t. As already

[120] The product-specific time-on-market fixed effect in equation 4 allows the intercept to be different for every product - time-on-market combination.

defined in equation 3, P_{it} and C_{it} are the price and cost of product i at calendar time t. The parameter θ_i allows the time-on-market trend to be product-specific.[121]

iii. There is a potential trade-off between omitted variable bias and attenuation bias when data are measured with error

126. Equations 1, 2, 3, and 5 are alternative specifications. To this point, we have discussed these alternatives in terms of how they model product quality and product life cycles. These are not the only relevant considerations though. When estimating a regression equation there is always a tradeoff associated with adding a control variable when the independent variable of interest is measured with error.[122] Doing so reduces the potential for omitted variable bias but increases what econometricians call attenuation bias due to measurement error.[123]

127. Adding an appropriate control variable likely makes sense if there is no measurement error. The potential for omitted variable bias is reduced and there is no attenuation bias. In practice, however, it is never possible to rule out measurement error entirely. As such, whether to add a control variable to a specification depends on: (a) the effect of the omitted variable on the dependent variable; (b) the correlation between the omitted variable and the independent variable of interest; and (c) the magnitude of any measurement error.[124]

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[121] The parameter θ_i allows the slope parameter for time-on-market to be product-specific.

[122] Measurement error here refers to stochastic error; that is, measurement error that is equal to zero on average. For example, suppose the independent variable of interest is acquisition cost. The theoretical concern about measurement error is that the observed acquisition cost may measure the true cost with error; that is, for some transactions the observed acquisition cost is higher than the true cost; for other transactions the observed acquisition cost is lower than the true cost. On average, however, if the measurement error is stochastic, the observed acquisition cost is equal to the true cost.

[123] When an independent variable in a regression is measured with (stochastic) error, its estimated coefficient is biased toward zero; that is, it is "attenuated." Adding a control variable to the regression reduces the "residual variation" in the independent variable if the control variable and independent variable are correlated. This reduction in residual variation increases attenuation bias. See, for example, Wooldridge, Jeffrey, *Introductory Econometrics: A Modern Approach, Second Edition*, Thomson South-Western, 2009, pp. 318-322.

[124] Conditions (a) and (b) determine the extent of omitted variable bias. Conditions (b) and (c) determine the extent of attenuation bias. The magnitude of measurement error refers to the variance of the measurement error.

128. If the omitted variable is expected to have a large effect on the dependent variable, and there is no specific reason to be concerned about measurement error, controlling for the omitted variable likely makes sense. The benefit associated with avoiding omitted variable bias outweighs the risk of greater attenuation bias. But if the omitted variable is not expected to have a large effect on the dependent variable, and there is a specific reason to be concerned about measurement error, whether to control for the omitted variable may be less clear. The benefit of avoiding omitted variable bias may or may not outweigh the risk of greater attenuation bias.

iv. Measurement error is a problem when prices and costs are not matched

129. The tradeoff between omitted variable bias and attenuation bias is potentially relevant when comparing equations 1, 2, 3, and 5.[125] Equations 3 and 5 include many more independent variables than equations 1 and 2 (equation 1 does not control for product quality or product life cycle; equation 2 controls for product quality but not product life cycle; equations 3 and 5 control for product quality and product life cycle). Omitted variable bias is a concern with equations 1 and 2. Attenuation bias is a concern with equations 3 and 5 *if cost is measured with error*.

130. The extent to which cost is measured with error, and hence, the tradeoff between omitted variable bias and attenuation bias, depends on the available data. In some cases, the information on prices and costs are provided together at the transaction level by the supplier of the data; that is, the price a seller paid to acquire a specific product and the price a seller charged for that product are "matched." In other cases, the information on prices and on costs are provided separately; that is, prices are provided in one transaction-level dataset (e.g., a "sales data" file) and costs in another transaction-level dataset (e.g., a "purchases data" file).

131. If transaction-level prices and costs are provided together by the supplier of the data (i.e., if the price and cost data are "matched" at the transaction level by the supplier of the data),

[125] Equation 4 cannot be estimated. The number of parameters to be estimated is greater than the number of observations in the data.

the benefit of controlling for an omitted variable (or variables) outweighs the risk of attenuation bias from measurement error. In such data, the price that the seller charged for a product and the price that the seller paid to acquire the product for a given transaction are for all intents and purposes known. Measurement error is not a significant concern with matched price-cost data.

132. The situation is different if the information on prices and costs are provided separately by the supplier of the data; that is, if prices are provided in one transaction-level dataset (a sales data file) and costs in another transaction-level dataset (a purchases data file). The econometrician can try to match acquisition costs to sale prices, but it is inevitable that this will be imprecise. He/she has no way to determine how much a seller paid to acquire a product that it sold in any given transaction. Based on the sales data, for example, the econometrician may know that a seller sold a product on a specific date, but he/she cannot determine when the seller acquired the product, and so cannot determine using the purchases data how much the seller paid for the product. The econometrician can make judgment calls (assumptions) about the timing between purchases and sales, but it is very likely that this will result in measurement error.

v. Measurement error can be avoided by using matched price-cost data

133. Matched price-cost data are available for certain LCD product manufacturers, distributors, wireless carriers, and retailers. To avoid the potential tradeoff between omitted variable bias and attenuation bias described above, we rely on matched price-cost data only. This is a point on which we and Professors Bernheim and Marx agree.[126,127]

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[126] Prof. Bernheim takes the same approach in his analyses of pass-through that rely on within-product cost variation:

> "I restricted this analysis to companies for which prices and costs are available from the same data source. I impose this restriction because, for this mode of analysis, it is important to ensure a close match between the products for which prices and costs are measured. Using different data sources raises the possibility that the two data sources may be imperfectly synchronized, in which case the prices and costs may refer to products produced at different points in time. Because this method exploits within-product covariation between prices and costs over time, the analysis is potentially sensitive to the quality of data synchronization. In my judgment, it is better to rely on data sources that purport to measure prices and costs for the same units. I therefore

134. Matched price-cost data are not available from all potentially relevant sellers (either because a seller did not produce any data or it produced price and cost data from different databases). In such cases, we use matched price-cost data that are available from other sellers who compete at the same level of the LCD supply chain. That is, to estimate pass-through to a plaintiff by upstream sellers for which we do not have matched price-cost data, we use the available data from the upstream sellers for which we do have matched price-cost data; to estimate pass-through by a plaintiff for which we do not have matched price-cost data, we use the available matched price-cost data from the sellers who compete at the plaintiff's level of the LCD supply chain. Prof. Bernheim takes the same approach to estimate pass-through by LCD product manufacturers, explaining that "[t]o a great extent, the rate of pass-through is a characteristic of the market rather than of the individual firm."[128,129] That is, firms that compete at the same level of the LCD supply chain tend to have similar average rates of pass-through.

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only included data that provided price and the corresponding cost information from the same source." Bernheim Circuit City Report, June 13, 2013, ¶249.

127 Prof. Marx also agrees with this approach.

> Q. Do you agree with Dr. Bernheim, that given a measurement error associated with unmatched purchase and sales data, that in this case it's better to use only matched price data to calculate pass-on when using a longitudinal analysis? A. I thought he made a reasonable choice there given the roles of the analysis and the challenged posed by the data. Q. So you agree with him, correct? A. I agree with the choice he made here, yes. Marx Deposition, October 9, 2013, 118:25-119:11.

128 Bernheim BrandsMart Report, June 13, 2013, ¶223. "To a great extent, the rate of pass-through is a characteristic of the *market* rather than of the individual firm. This is because pass-through is driven by the nature of demand, technology, and the degree of competition between the firms that populate the industry. Thus, one can draw reasonable inferences concerning the likely rate of pass-through for a given firm by measuring pass-through rates for the firms with which it competes. Even when data for a given firm are available, there is a trade-off between relying on the estimated pass-through rate for the firm in question, versus the average pass-through rate for the industry, which may be more representative of general industry dynamics and less susceptible to the influence of idiosyncratic events."

129 Marx Deposition, October 9, 2013, p. 124:1-7. "That's correct. And that's consistent with the way economists think about the pass-through rate being as a feature of an industry. Particularly, a pass-through rate for an industrywide, as would be appropriate in this case, a pass-through rate for an industrywide change in the underlying cost."

vi. There are different ways to control for product life cycles

135. Equations 3 and 5 control for product life cycles differently. Each is more flexible along one dimension and more restrictive along another. Equation 3 allows the effect of time-on-market to be non-linear, but restricts it to be the same for all products. Equation 5 allows the effect of time-on-market to be product-specific, but restricts it to be linear. Neither has a clear advantage in terms of controlling for the effect of the product life cycle. This means that attenuation bias is the main consideration when comparing equations 3 and 5.[130] Equation 3 has the advantage here. It causes less attenuation than equation 5.[131]

vii. Equation 3 can be estimated in different ways

136. Equation 3 can be estimated by using the data without any transformation. This is sometimes referred to as estimation in levels. The econometrician can obtain identical estimates of the parameters of interest by demeaning the data. This is sometimes done for computational ease. The equation can also be estimated in first differences. In all cases, the estimates of the parameters of interest (e.g., pass-through) are unbiased if the regressors are orthogonal to the error term. In previous phases of this litigation, Prof. Bernheim expressed a concern about using first-differenced data if measurement error is important and price responds to cost with a lag.[132] We believe this concern is unfounded when the price and cost data are matched by the seller and aggregated over multiple periods (e.g., a calendar quarter). To address Prof. Bernheim's concerns, however ill-founded, we estimate equation 3 in levels (or, equivalently, using demeaned data). Like Prof. Blair, we also report pass-

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130 Although we see no reason why attenuation bias is enough of a concern to justify not controlling for the product life cycle, if the choice is between two specifications that control for the product life cycle differently, and neither specification has a clear advantage along this dimension, it makes sense to consider how each specification affects attenuation.

131 Adding a control for the product life cycle reduces the residual variation in cost. The effect on attenuation depends on the magnitude of the reduction in residual variation in cost. The time-on-market fixed effects reduce residual variation in cost less than the product-specific time-on-market trends. See Exhibit V.2.

132 Rebuttal Expert Report of B. Douglas Bernheim, Ph.D., Concerning Best Buy Co., Inc. et al., *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-4572-SI, Master File No. 3:07-MD-1827, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, May 11, 2012, (hereafter "Bernheim Best Buy Rebuttal Report, May 11, 2012"), ¶480.

through estimates that use differenced data, consistent with Dean Snyder's approach in previous phases of this litigation. We report in Appendix M estimates of equation 3 using demeaned data, and estimates of Dean Snyder's first differences model from previous phases of this litigation.[133]

viii. Upstream and downstream approaches to pass-through should be consistent

137. Upstream and downstream approaches to pass-through should be consistent. Professors Bernheim, Blair, and Marx do not agree that it is necessary to control for product quality and product life cycles when estimating downstream pass-through by LCD product manufacturers. We disagree. But putting aside that disagreement for the moment, if the econometrician concludes that controlling for product quality and product life cycles is *not* necessary when estimating downstream pass-through by LCD product manufacturers, it should follow that controlling for product quality and product life cycles is *not* necessary when estimating downstream pass-through by LCD product distributors and retailers. If product quality and product life cycles are not important for LCD product manufacturers, they will not be important for LCD product distributors and retailers. As such, it would be wrong to estimate downstream pass-through by LCD product manufacturers and not control for product quality and product life cycles, and then estimate downstream pass-through by LCD product distributors and retailers controlling for product quality and product life cycles. This approach would get the relevant economics upside down. Equivalently, it would be wrong to use an estimate of downstream pass-through by LCD product manufacturers that does not control for product quality and product life cycles, and use an estimate of downstream pass-through by LCD product distributors and retailers that controls for product quality and product life cycles.

138. Internal consistency is especially important here. This report addresses pass-through by LCD product manufacturers, distributors, buyer cooperatives, retailers, and wireless

[133] The average pass-through estimate is 95 percent using equation 3 and demeaned data. The average pass-through estimate is 92 percent using Dean Snyder's first differences model from previous phases of this litigation.

carriers. Upstream pass-through in one case is downstream pass-through in another case. Upstream pass-through to a retailer, for example, is downstream pass-through by a product manufacturer, distributor, or wireless carrier.[134] It would make no sense to estimate upstream pass-through to a retailer by a distributor using one method in one case and then estimate downstream pass-through to a retailer by a distributor using a different approach in a different case.

VI. EVALUATION OF THE PLAINTIFFS' EXPERTS' ANALYSES

A. Overview

139. We have been asked to review certain analyses offered by the following plaintiffs' experts: Prof. B. Douglas Bernheim, Prof. Roger D. Blair, Prof. Leslie M. Marx, and Dr. Karl N. Snow.[135]

140. Prof. Bernheim submitted reports for fourteen of the fifteen plaintiffs. In four of these reports, Prof. Bernheim estimates panel overcharges, volume of commerce for direct purchases, and damages on direct purchases;[136] in the other ten, he estimates panel overcharges, pass-through by LCD product manufacturers, volume of commerce for direct purchases, and damages on direct purchases.[137]

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[134] Prof. Marx recognizes this when she agrees that 100 percent pass-through by distributors to a plaintiff applies to plaintiff-distributor Tech Data's sales to other plaintiffs like CompuCom. Marx Deposition, October 9, 2013, p. 171:6-18.

> Q. Okay. So if Tech Data is a distributor that sold to CompuCom, and all of the distributors that sold to CompuCom passed on overcharges to CompuCom at a rate of 100 percent, and Tech Data passed on any overcharge it received 100 percent to CompuCom – Is that correct? […] A. That's my opinion that they would have passed on – In those sales by Tech Data to CompuCom, I would have expected that they passed through a hundred percent in those sales.

[135] Professors Bernheim and Marx submitted reports for Electrograph in Tracks 1 and 2. Electrograph named NEC as an additional defendant in its Track 2 claims. We understand that NEC and Electrograph have settled. We therefore do not address Professors Bernheim and Marx's Track 2 Electrograph reports.

[136] All American Semiconductor; Jaco; NECO Alliance; and Syntax Brillian.

[137] ABC Warehouse; BrandsMart; Circuit City; CompuCom; MARTA; MetroPCS; Office Depot; P.C. Richard; Tech Data; and Tweeter.

141. Dr. Snow submitted a report for one of the fifteen plaintiffs, Syntax Brillian ("Syntax"), a television manufacturer. Dr. Snow opines that Prof. Bernheim's panel overcharge estimates are "reliable," assumes that pass-through by finished product assemblers to Syntax was 100 percent, estimates Syntax's volume of commerce for indirect purchases, and estimates Syntax's damages on indirect purchases. Dr. Snow does not address downstream pass-through by Syntax.

142. Prof. Marx submitted reports for ten of the fifteen plaintiffs.[138] In each report, Prof. Marx opines that Prof. Bernheim's panel overcharge estimates are "reliable," that Prof. Bernheim's estimates of pass-through by LCD product manufacturers are "reliable," asserts that pass-through by LCD product distributors in certain instances was 100 percent,[139] estimates volume of commerce for indirect purchases, and estimates damages on indirect purchases.

143. Prof. Blair submitted a report for one of the fifteen plaintiffs, TracFone. In this report, Prof. Blair estimates panel overcharges, estimates pass-through to TracFone, estimates pass-through by TracFone, estimates TracFone's volume of commerce for direct and indirect purchases, and estimates TracFone's damages on direct and indirect purchases.

144. Of the fourteen plaintiffs for whom Prof. Bernheim submitted a report, eleven claim damages on indirect purchases.[140] Prof. Marx and Dr. Snow have offered opinions about pass-through *to* these eleven plaintiffs, but have not explicitly offered opinions about pass-through *by* them. However, Professors Bernheim and Marx consider Syntax Brillian to be an LCD product manufacturer and Tech Data to be a distributor,[141] and they argue that pass-through by LCD product manufacturers and distributors is 100 percent or more. While we do not agree with the methods they use to reach these conclusions, we note that if pass-

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138 ABC Warehouse; BrandsMart; Circuit City; CompuCom; MARTA; MetroPCS; Office Depot; P.C. Richard; Tech Data; and Tweeter.

139 Prof. Marx opines that pass-through by distributors that competed with manufacturers for sales to resellers was at least 100 percent. Marx BrandsMart Report, June 13, 2013, ¶41.

140 ABC Warehouse; BrandsMart; Circuit City; CompuCom; MARTA; MetroPCS; Office Depot; P.C. Richard; Syntax Brillian; Tech Data; and Tweeter.

141 The file "Supplier type translation.xlsx" from Professors Bernheim and Marx's backup identifies Syntax Brillian as a manufacturer and Tech Data as a distributor.

through by LCD product manufacturers and distributors is 100 percent or more, the two plaintiffs that are LCD product manufacturers or distributors (Syntax and Tech Data) would have passed through 100 percent of any overcharges that reached them, and so their damages on indirect purchases would be zero. Prof. Marx, for example, estimates indirect damages for CompuCom and asserts that pass-through to CompuCom by distributors, including plaintiff Tech Data, was 100 percent.[142]

145. Counsel has asked us to review each of the above expert's analysis of pass-through, estimation of volume of commerce, and estimation of damages. We have not been asked to review or comment on Prof. Bernheim or Prof. Blair's analyses of panel overcharges, except to the extent reflected in Section II.

B. Prof. Bernheim's Reports

i. Prof. Bernheim's analysis of pass-through by LCD product manufacturers

146. Prof. Bernheim estimates pass-through by manufacturers of LCD televisions, monitors, notebooks, mobile phones, digital cameras, and camcorders.[143]

147. Figure VI.1 shows the position of LCD product manufacturers in the LCD product supply chain. Some purchased inputs, including LCD panels from LCD panel manufacturers and used those inputs to manufacture LCD products themselves. Others purchased LCD products from product assemblers who had purchased the LCD panels from the LCD panel manufacturers.[144] All LCD product manufacturers sold LCD products to resellers (e.g.,

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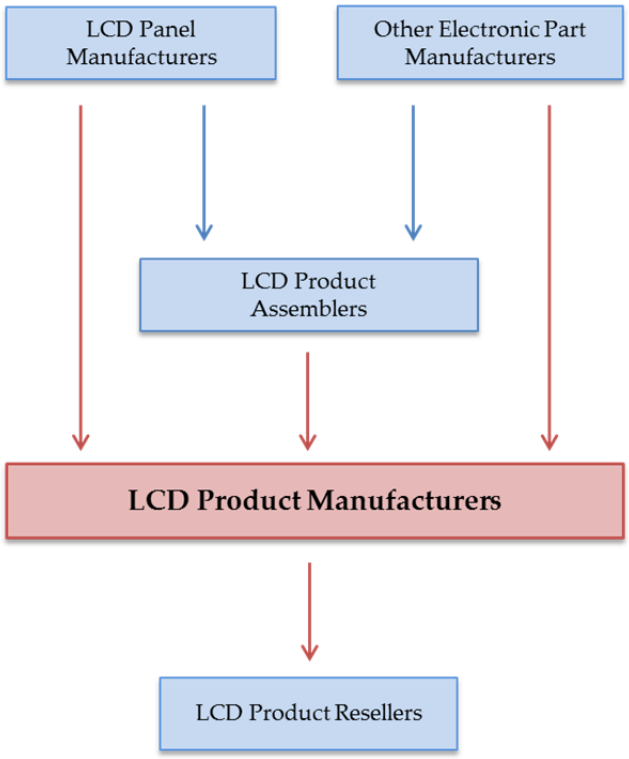
[142] CompuCom's indirect claims include finished product purchases from plaintiff Tech Data (19 percent), other distributors (32 percent), manufacturers (46 percent), and unclassified vendors (3 percent). (Suppliers are classified using the file "Supplier type translation.xlsx" from Professors Bernheim and Marx's backup.)

[143] Prof. Bernheim uses data supplied by four defendants and six non-defendants: Philips, Samsung, Sharp, and Toshiba; and Acer, Apple, Dell, Kodak, Motorola, and Westinghouse Digital Electronics.

[144] We report in Exhibit VI.1 the (unit) share of selected alleged conspirators' LCD product sales that were assembled by third parties. 31 percent of these defendants' LCD product sales were assembled by third parties. We report in Exhibit VI.2 that seven defendants shipped 112 million LCD panels to assemblers over the 1998 – 2006 period and that the assembler was identified as the "bill-to" entity for

distributors and retailers). Thus, Prof. Bernheim estimates pass-through by LCD product manufacturers, which is pass-through to LCD product resellers. Prof. Bernheim does not estimate pass-through by LCD product resellers.[145, 146]

Figure VI.1: Prof. Bernheim's Analysis of Pass-Through by LCD Product Manufacturers



47 percent of these units. (Shipments of panels to assemblers that also manufactured branded products are excluded from this calculation.) Many of the LCD products that defendants sold were assembled by a third party that had purchased the LCD panel.

145 Deposition of B. Douglas Bernheim, Ph.D., *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, In The United States District Court, Northern District Court of California, San Francisco Division, September 19, 2013, (hereafter "Bernheim Deposition, September 19, 2013"), pp. 180:25-181:3.

> A. I am looking at that level, going from companies that are making these branded products to the companies that are purchasing them, and I haven't used this method for anything else.

146 We use Prof. Bernheim's regression specifications to estimate pass-through *by* plaintiffs, in addition to pass-through by LCD product manufacturers *to* plaintiffs. We report these estimates in Exhibits VI.3 – VI.14. The estimates of pass-through by plaintiffs are 100 percent or more for most product applications. This would imply that indirect damages are zero for most plaintiffs and most product application types.

148. In cases where the LCD product manufacturers purchased products from LCD product assemblers, the amount of any overcharge that reached the LCD product resellers depends on pass-through by the product assemblers and product manufacturers. If, for example, pass-through by LCD product assemblers was 90 percent and pass-through by LCD manufacturers was 100 percent, 90 percent of any overcharge would have reached LCD product resellers. Prof. Bernheim does not analyze pass-through by LCD product assemblers.[147] Consequently, in cases where the LCD product manufacturers purchased products from an LCD product assembler and then sold those products to LCD product resellers, Prof. Bernheim cannot determine the amount of any overcharge that reached the resellers.[148]

149. Prof. Bernheim estimates eight different econometric specifications. He reports estimates of pass-through that are consistently above 100 percent. His opinion is that LCD product manufacturer pass-through is 100 percent or more.

150. In this section we discuss Prof. Bernheim's eight specifications. We explain that each specification has one of two flaws. Six do not control for product quality or attempt to control for product quality in a way that is inferior to a readily available alternative; two control for product quality, but do not control for product life cycles. It is our opinion that none of Prof. Bernheim's eight specifications adequately controls for both product quality and product life cycles.

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147 Marx Deposition, October 9, 2013, pp. 195:8-196:4.

> Q. So neither you nor Dr. Bernheim ever studied pass-on from any ODM for the virtual business model you identify in footnote 19; is that correct? A. The pass-through analysis that was done is taking the cost from the ODM and then what is passed through in the LCD product of what's been labeled the manufacturer here. So the costs are -- It's not the pass-through by the ODM. Q. So you've not calculated pass-on specifically for ODMs; is that correct? A. The pass-through analysis -- the data that's used in the pass-through analysis, I don't believe we have -- I don't believe that Professor Bernheim is using in his pass-through analysis, that he's using input cost and sales prices for ODMs.

148 Prof. Bernheim also does not report the proportion of plaintiffs' purchases where the LCD product manufacturer purchased the LCD product from an assembler.

151. The task of the econometrician here is to adopt the specification that is most likely to provide an accurate estimate of pass-through by LCD product manufacturers. In our opinion, Prof. Bernheim has not done so. Each of his eight specifications has a flaw that has a straightforward correction; there is an alternative to each of his eight specifications that is more likely to provide an accurate estimate of pass-through by LCD product manufacturers. As such, the purported consistency of Prof. Bernheim's 100 percent plus pass-through estimates across his eight specifications is illusory. The eight specifications share a common flaw and the purported consistency reflects this common flaw.

a. Prof. Bernheim's equation 4

152. Prof. Bernheim's equation 4 is the following:

$$P_{im} = \alpha_m + \beta_m * C_{im} + e_{im},$$

where P_{im} is the quantity-weighted average price of product i over its life cycle, C_{im} is the quantity-weighted average cost of product i over its life cycle, α_m is a manufacturer-specific intercept, and β_m is a manufacturer-specific cost coefficient.[149]

153. Prof. Bernheim reports estimates of pass-through that range from 99 percent to 172 percent; the average of the estimates is 132 percent; the median is 129 percent.[150]

154. Prof. Bernheim's equation 4 does not control for product quality. We explain in Section V that some LCD products are higher "quality" than others, and we explain why it is important to control for product quality when estimating the effect of cost on price. Higher quality products typically cost more to produce, and, to a certain extent, their prices reflect this.[151] But some of the effect of product quality on price can be distinct from the relationship between product quality and cost, which means that higher quality products may be priced at higher mark-ups than lower quality products.

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[149] See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶232-233.

[150] See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 32.

[151] Technological advances may result in lower costs and higher quality over time. However, at any point in time, higher quality products will tend to be more costly to manufacture than lower quality products.

155. Because equation 4 does not control for product quality, Prof. Bernheim has no way to know how much of his estimated pass-through rate reflects pass-through and how much reflects unmodeled product quality. Prof. Bernheim chooses to interpret his estimates in a specific way—that is, that they reflect 100 percent pass-through plus an "additional mark-up"—but that interpretation is arbitrary.[152] Prof. Bernheim's estimates are equally consistent with 90 percent pass-through plus a larger mark-up, 80 percent pass-through plus an even larger mark-up, or 70 percent pass-through plus a yet larger mark-up.

156. It is our opinion that not controlling for product quality is an easily avoided mistake. Rather than averaging prices and costs over each product's life cycle and estimating a specification that does not actually "identify" the pass-through rate, a better approach is to not average prices and costs over each product's life cycle, and estimate a specification that includes controls for quality differentiation and the effect of the product life cycle on price. (See discussion in Section V.)

b. Prof. Bernheim's equation 5

157. Prof. Bernheim's equation 5 is the following:

$$P_{im} = \alpha_m + \beta^* C_{im} + e_{im},$$

where P_{im} is the quantity-weighted average price of product i over its life cycle, C_{im} is the quantity-weighted average cost of product i over its life cycle, α_m is a manufacturer-specific intercept, and β is an industry-wide cost coefficient.[153]

158. Prof. Bernheim reports estimates of pass-through that range from 122 percent to 153 percent; the average of the estimates is 132 percent; the median is 128 percent.[154]

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[152] Prof. Bernheim estimates pass-through rates that are consistently higher than 100 percent and interprets them as 100 percent pass-through plus an additional mark-up. See, for example., Bernheim BrandsMart Expert Report, June 13, 2013, ¶236 ("Notice that all models but one imply 100% pass-through of costs plus an additional markup"), and ¶250 ("In all but five cases, the models imply 100% pass-through of costs plus an additional markup.")

[153] See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶234-235.

[154] See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 32.

159. This specification is identical to Prof. Bernheim's equation 4 except that it restricts the estimated pass-through rate to be the same for all LCD product manufacturers. For the same reasons as above, it is our opinion that this equation does not identify the pass-through rate.

c. Prof. Bernheim's equation 6

160. Prof. Bernheim's equation 6 is the following:

$$P_{im} = \beta_m * C_{im} + \lambda_a + e_{im},$$

where P_{im} is the quantity-weighted average price of product i over its life cycle, C_{im} is the quantity-weighted average cost of product i over its life cycle, λ_a is a "product-category" fixed effect, and β_m is a manufacturer-specific cost coefficient.[155]

161. Prof. Bernheim reports estimates of pass-through that range from 99 percent to 172 percent; the average of the estimates is 125 percent; the median is 125 percent.[156]

162. The problem with this specification is that the product category fixed effects do not control for differences in product quality within the so-called product categories.

163. Specific examples illustrate this point. One of the product categories in Prof. Bernheim's notebook sample is "TOSHIBA_OME-15.4". Two models in this product category are the Toshiba Qosmio F25-AV205 ("Qosmio") and the Toshiba Satellite M35X-S163 ("Satellite"). Table VI.1 shows that the Qosmio has a hard drive with more capacity (100 gigabytes compared to 60), more random-access memory (one gigabyte compared to 512 megabytes), and a faster processor (1.86 gigahertz compared to 1.4).

[155] See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶237-238.

[156] See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 33.

Table VI.1
Toshiba Notebooks Included in Prof. Bernheim's
"TOSHIBA_OME-15.4" Product Category

Toshiba Notebook	Hard Drive Size	RAM	CPU Speed	Product Price	Product Cost	Product Mark-Up
Qosmio F25-AV205	100 GB	1 GB	1.86 GHz	$1,687	$1,146	32%
Satellite M35X-S163	60 GB	512 MB	1.4 GHz	$919	$671	27%

Notes:
[1] Product prices and costs are calculated by Prof. Bernheim as averages over the entire life of the product.
[2] Product mark-ups are equal to product price minus product cost divided by product price.

Sources:
[1] "Toshiba Qosmio F25-AV205 Specifications," *CNET*, www.cnet.com/laptops/toshiba-qosmio-f25-av205/4507-3121_7-32455511.html, visited on September 10, 2013.
[2] "Toshiba Qosmio M35X-S163 Specifications," *CNET*, www.cnet.com/laptops/toshiba-satellite-m35x-s163/4507-3121_7-31322069.html, visited on September 10, 2013.
[3] Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph.D., June 13, 2013.

164. Table VI.1 also shows that the Qosmio costs Toshiba more to manufacture than the Satellite ($1,146 compared to $671), that Toshiba charges more for the Qosmio than for the Satellite ($1,687 compared to $919), and that Toshiba marks up the price of the Qosmio more than the price of the Satellite (32 percent compared to 27 percent). That Toshiba marks up the price of the Qosmio more than the Satellite is consistent with the demand for the Qosmio being different from the demand for the Satellite.

165. Another of Prof. Bernheim's product categories is "TOSHIBA_OME-". This category includes a variety of notebooks with different characteristics, including two Toshiba "Tecra" series notebooks, the M6 and M2. Table VI.2 shows that the M6 has a hard drive with more capacity (100 gigabytes compared to 40), more random-access memory (two gigabyte compared to 512 megabytes), and a faster processor (2.17 gigahertz compared to 1.4).

Table VI.2
Toshiba Notebooks Included in Prof. Bernheim's
"TOSHIBA_OME-" Product Category

Toshiba Notebook	Hard Drive Size	RAM	CPU Speed	Product Price	Product Cost	Product Mark-Up
Tecra M6	100 GB	2 GB	2.17 GHz	$2,420	$1,167	52%
Tecra M2	40 GB	512 MB	1.4 GHz	$1,615	$975	40%

Notes:
[1] Product prices and costs are calculated by Prof. Bernheim as averages over the entire life of the product.
[2] Product mark-ups are equal to product price minus product cost divided by product price.

Sources:
[1] "Toshiba Tecra M6 Specifications," *CNET*, www.cnet.com/laptops/toshiba-tecra-m6-12/4507-3121_7-32097034.html, visited on September 10, 2013.
[2] "Toshiba Tecra M2 Specifications," *CNET*, www.cnet.com/laptops/toshiba-tecra-m2-pentium/4507-3121_7-30825103.html, visited on September 10, 2013.
[3] Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph.D., June 13, 2013.

166. Table VI.2 also shows that the M6 costs Toshiba more to manufacture than the M2 ($1,167 compared to $975), that Toshiba charges more for the M6 than for the M2 ($2,420 compared to $1,615), and that Toshiba marks up the price of the M6 more than the M2 (52 percent compared to 40 percent). That Toshiba marks up the price of the M6 more than the M2 is consistent with the demand for the M6 being different from the demand for the M2.

167. In these two examples, *within Prof. Bernheim's product categories*, product quality is correlated with cost and product quality is correlated with mark-up. The notebooks with the better features cost more to manufacture and they are marked up more. This illustrates the problem with Prof. Bernheim's specification. His product category fixed effects do not control for differences in product quality within the so-called product categories.

d. Prof. Bernheim's equation 7

168. Prof. Bernheim's equation 7 is the following:

$$P_{im} = \beta^* C_{im} + \lambda_a + e_{im},$$

where P_{im} is the quantity-weighted average price of product i over its life cycle, C_{im} is the quantity-weighted average cost of product i over its life cycle, λ_a is a "product-category" fixed effect, and β is an industry-wide cost coefficient.[157]

169. Prof. Bernheim reports estimates of pass-through that range from 113 percent to 153 percent; the average of the estimates is 115 percent; the median is 136 percent.[158]

170. This specification is identical to Prof. Bernheim's equation 6 except that it restricts the estimated pass-through rate to be the same for all LCD product manufacturers. For the same reasons articulated above, it is our opinion that this equation does not identify the pass-through rate.

e. Prof. Bernheim's equation 8

171. Prof. Bernheim's equation 8 is the following:

$$P_{im} = \beta_m * C_{im} + \lambda_a + \tau_t * s_{it} + e_{im},$$

where P_{im} is the quantity-weighted average price of product i over its life cycle, C_{im} is the quantity-weighted average cost of product i over its life cycle, λ_a is a "product-category" fixed effect, τ_t is a month fixed effect, s_{it} is the fraction of sales for product i that took place in month t, and β_m is a manufacturer-specific cost coefficient.[159]

172. Prof. Bernheim reports estimates of pass-through that range from 71 percent to 166 percent; the average of the estimates is 121 percent; the median is 122 percent.[160]

173. This specification is the same as Prof. Bernheim's equation 6 except that it controls for period fixed effects (i.e., it includes $\tau_t * s_{it}$). These period fixed effects do not control for differences in quality across products that were sold during the same periods of time. For the same reasons articulated above, it is our opinion that this equation does not identify the pass-through rate.

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157 See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶239-240.

158 See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 33.

159 See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶241-242.

160 See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 34.

f. Prof. Bernheim's equation 9

174. Prof. Bernheim's equation 9 is the following:

$$P_{im} = \beta * C_{im} + \lambda_a + \tau_t * s_{it} + e_{im},$$

where P_{im} is the quantity-weighted average price of product i over its life cycle, C_{im} is the quantity-weighted average cost of product i over its life cycle, λ_a is a "product-category" fixed effect, τ_t is a month fixed effect, s_{it} is the fraction of sales for product i that took place in month t, and β_m is an industry-wide cost coefficient.[161]

175. Prof. Bernheim reports estimates of pass-through that range from 111 percent to 153 percent; the average of the estimates is 113 percent; the median is 129 percent.[162]

176. This specification is identical to Prof. Bernheim's equation 8 except that it restricts the estimated pass-through rate to be the same for all LCD product manufacturers. For the same reasons articulated above, it is our opinion that this equation does not identify the pass-through rate.

g. Prof. Bernheim's equation 10

177. Prof. Bernheim's equation 10 is the following:

$$P_{imt} = \beta_m * C_{imt} + \delta_i + e_{imt},$$

where P_{imt} is the quantity-weighted average price of product i in month t, C_{imt} is the quantity-weighted average cost of product i in month t, δ_i is a product fixed effect, and β_m is a manufacturer-specific cost coefficient.[163]

178. Prof. Bernheim reports estimates of pass-through that range from 57 percent to 139 percent; the average of the estimates is 108 percent; the median is 106 percent.[164]

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161 See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶243-244.

162 See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 34.

163 See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶246-247.

164 See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 35.

179. This specification controls for product quality, but does not control for product life cycles. We explain in Section V that LCD products have life cycles, and we explain why it is important to control for them when estimating the effect of cost on price. Over the life cycle of a product, demand weakens, which leads to price decreases. This phenomenon shows up in e_{imt} in Prof. Bernheim's equation 10. This weakening of demand coincides with—is correlated with—decreases in the cost of making the product. But in specifying equation 10, Prof. Bernheim assumes that the weakening of demand is uncorrelated with decreases in cost over the life cycle. The consequence is that decreases in price caused by the weakening of demand are incorrectly attributed to decreases in cost, resulting in an overestimate of pass-through.

180. Not controlling for product life cycles is a problem that *can be avoided* by controlling for the amount of time that a product has been on the market. In Section V we discuss two alternative ways to do this: (1) time-on-market fixed effects and (2) product-specific time-on-market trends. We also explain that these alternatives have tradeoffs, and we explain why we prefer the time-on-market fixed effect approach to the product-specific time-on-market trend approach. But independent of which alternative one prefers, including one or the other in Prof. Bernheim's equation 10 represents an improvement to Prof. Bernheim's model.

h. Prof. Bernheim's equation 11

181. Prof. Bernheim's equation 11 is the following:

$$P_{imt} = \beta^{*}C_{imt} + \delta_i + e_{imt},$$

where P_{imt} is the quantity-weighted average price of product i in month t, C_{imt} is the quantity-weighted average cost of product i in month t, δ_i is a product fixed effect, and β_m is an industry-wide cost coefficient.[165]

182. Prof. Bernheim reports estimates of pass-through that range from 57 percent to 133 percent; the average of the estimates is 110 percent; the median is 119 percent.[166]

[165] See, for example, Bernheim BrandsMart Report, June 13, 2013, ¶¶248-249.

183. This specification is identical to Prof. Bernheim's equation 10 except that it restricts the estimated pass-through rate to be the same for all LCD product manufacturers. For the same reasons articulated above, our opinion described in paragraphs 175-178 applies with equal force to Prof. Bernheim's equation 11.

ii. Application of Prof. Bernheim's pass-through analysis downstream

184. If one assumes – as Prof. Bernheim does – that it is not necessary to control for both quality differentiation and the product life cycle when estimating downstream pass-through by LCD product manufacturers, one should be consistent and make the same assumption when estimating downstream pass-through by LCD product distributors and retailers. To do otherwise would get the relevant economics upside down.

185. To illustrate the damages implications of Prof. Bernheim's assumption that it is not necessary to control for both quality differentiation and the product life cycle, we estimate downstream pass-through by LCD product distributors, buyer cooperatives, technology service providers, retailers and wireless carriers using Prof. Bernheim's regression equations. (Results are reported in Exhibits VI.3 – VI.14.) The estimates of downstream pass-through are at least 100 percent for nearly every product type. All plaintiffs claiming damages on indirect purchases are LCD product distributors, buyer cooperatives, technology service providers, retailers or wireless carriers. Thus, if one were to use Prof. Bernheim's regression equations to estimate pass-through throughout the LCD product supply chain, damages on indirect purchases would be zero or almost zero for nearly all plaintiffs.

iii. Prof. Bernheim's estimates of volume of commerce

186. Prof. Bernheim estimates volume of commerce and damages for the following plaintiffs: ABC Warehouse; All American Semiconductor; BrandsMart; Circuit City; CompuCom; Jaco; MARTA; MetroPCS; NECO Alliance; Office Depot; P.C. Richard; Syntax Brillian; Tech Data; and Tweeter.

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[166] See, for example, Bernheim BrandsMart Report, June 13, 2013, Figure 35.

187. Prof. Bernheim estimates the plaintiffs' direct volume of commerce using the plaintiffs' transaction-level purchase data. Where he also has transaction-level sales data from the defendants, he uses the defendants' data. He adds up the number of units of LCD products purchased directly by the plaintiffs, adjusts the units by the alleged conspirator panel share, and multiplies by the median price of the relevant LCD panel.

188. We have been asked to review Prof. Bernheim's estimates of the plaintiffs' direct volume of commerce. In our opinion, Prof. Bernheim makes the following errors in processing the plaintiffs' data:

i. Prof. Bernheim includes purchases with negative quantities in his estimate of ABC Warehouse's volume of commerce. ABC Warehouse has indicated that such purchases are data entry errors and should not be included when calculating ABC Warehouse's total purchases.[167]

ii. BrandsMart's purchase data identify the vendor and the manufacturer of each LCD product that BrandsMart purchased. The vendor field is relevant to determining whether a purchase is direct from an alleged conspirator or alleged affiliate. But Prof. Bernheim uses the manufacturer field to identify the vendor from which BrandsMart purchased. This leads him to overestimate BrandsMart's volume of direct purchases from alleged conspirators and alleged affiliates.[168]

iii. MetroPCS only claims damages on purchases of TFT-LCD panels and LCD products containing TFT-LCD panels. Consequently, Prof. Bernheim removes purchases of STN-LCD and other non-TFT panels from his volume of commerce. One of the LCD products that Prof. Bernheim includes in his volume of commerce

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[167] Felder, Melissa, Letter to Brandon Martin, Regarding Letters of May 2 and May 10, 2013 Regarding Transactional Data Production, May 15, 2013, 2013.05.15 Letter to B. Martin.pdf; and Felder, Melissa, Letter to Brandon Martin, Regarding Letter of May 23, 2013, Responding to Questions, May 30, 2013, 2013.05.30 Letter to Martin.pdf.

[168] Fenlon, Christopher V., Letter to Sanjay Nangia, Regarding Letter of September 7, 2012 with Questions Regarding Data, September 19, 2012, 2012-09-19 C Fenlon Ltr to S Nangia re BrandsMart Data.pdf.

estimate is the Samsung A850 phone. This model contains an STN-LCD panel and so should be excluded from MetroPCS' volume of commerce.[169]

iv. Syntax provided what it calls "two alternative measures of damages."[170] Prof. Bernheim assumes that all of Syntax's purchases were direct, even though Syntax purchased televisions from Taiwan Kolin (a non-conspirator) and Taiwan Kolin purchased LCD panels from panel manufacturers. Dr. Snow also submitted an expert report for Syntax, but assumes that all of Syntax's purchases were indirect.[171] Dr. Snow also testified that Syntax's data indicate that Syntax purchased only from Taiwan Kolin and that Syntax did not purchase panels directly.[172] Prof. Bernheim's assumption that Syntax's purchases were direct is inconsistent with Dr. Snow's testimony.

v. Prof. Bernheim includes transactions with missing costs in his estimate of Tweeter's volume of commerce. Tweeter has indicated that these transactions represent items that Tweeter did not pay for and should not be included when calculating its total purchases.[173,174]

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169 "Samsung SCH-A850 Specifications," *Phonescoop.com*, http://www.phonescoop.com/phones/phone.php?p=759, visited on October 30, 2013.

170 Snow Expert Report, June 13, 2013, ¶10.

171 Snow Expert Report, June 13, 2013, ¶9.

172 Deposition of Karl N. Snow, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-cv-5458-SI, MDL No. 1827, In The United States District Court, Northern District Court of California, San Francisco Division, October 10, 2013, (hereafter "Snow Deposition, October 10, 2013"), pp. 170:13-171:2.

> Q. When you looked at Syntax, the records of Syntax -- okay? -- it was clear to you that the transactions, based on your review, what you were looking at, were the purchases of televisions from Kolin. Fair? A. That's – that's my understanding, yes. Q. All right. All right. And so, in order to opine on -- on whether or not the evidence you saw was consistent with the assumption you were asked to make of a hundred percent pass-through from Kolin to Syntax, you had to develop some sort of understanding of the economic relationship between Syntax and Kolin. Isn't that fair to say? A. It's fair to say.

173 Beyda, Andrew L., Letter to Herman J. Hoying, Responding to Letter of May 2, 2013 Concerning Transactional Data, June 24, 2013, (2013 06 24) Letter to H Hoying re Tweeter Transactional Data.pdf.

174 Tweeter produced supplemental purchase data after Prof. Bernheim submitted his report. We include these data in our estimates of Tweeter's volume of commerce.

vi. In Exhibits 1 and 2 of his reports, Prof. Bernheim attributes the plaintiff's direct damages to each of its suppliers. However, Prof. Bernheim made some errors when translating the raw supplier names in the data to the standardized names in the exhibits of his report. As a result, he considers some purchases to be direct even though the supplier was not an alleged conspirator or alleged affiliate.[175]

C. Prof. Marx's Reports

189. Prof. Marx estimates damages on indirect purchases made by technology services provider CompuCom, distributor Tech Data, buyer cooperative MARTA, wireless carrier MetroPCS, and retailers ABC Warehouse, BrandsMart, Circuit City, Office Depot, P.C. Richard, and Tweeter. In so doing, Prof. Marx adopts Prof. Bernheim's analysis and opinion that pass-through by LCD product manufacturers was 100 percent or more.

190. Prof. Marx estimates damages on indirect purchases for plaintiffs that purchased from manufacturers and/or distributors. For purchases from manufacturers, Prof. Marx estimates indirect damages by: (a) ignoring pass-through by product assemblers, (b) assuming that pass-through by manufacturers was 100 percent, and (c) ignoring pass-through by the plaintiff. For purchases from distributors, Prof. Marx estimates damages by: (a) ignoring pass-through by product assemblers, (b) assuming that pass-through by manufacturers was 100 percent, (c) asserting that pass-through by distributors was 100 percent, and (d) ignoring pass-through by the plaintiff.

191. Prof. Marx's estimation of damages on indirect purchases in the retailer cases has an obvious implication for the estimation of damages on indirect purchases in the distributor cases. If pass-through by distributors to retailers was 100 percent in the retailer cases — as Prof. Marx asserts — pass-through by distributors to retailers in the distributor cases was

[175] For example, Prof. Bernheim includes Jaco's purchases from Hitachi Electronic Devices in his estimate of direct damages. However, Jaco does not name Hitachi Electronic Devices as an alleged conspirator or alleged affiliate in its complaints or responses to interrogatories. In Appendix E, we separate purchases from entities not named in complaints or interrogatory responses from purchases from named entities.

100 percent. This would mean that indirect damages for a distributor on purchases that the distributor resold to retailers are zero.

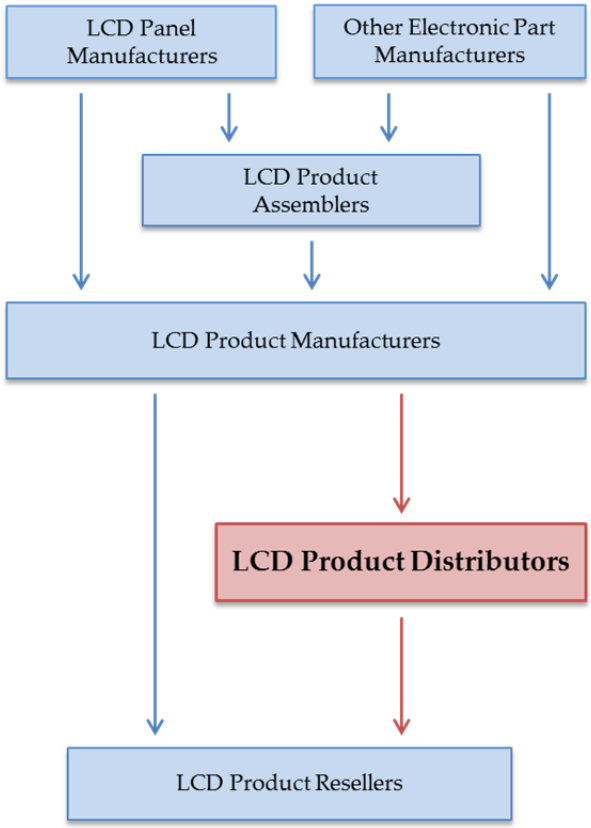
192. Finally, Prof. Marx estimates damages on indirect purchases where: (a) a product assembler purchased an LCD panel; (b) used it to manufacture an LCD product for an LCD product manufacturer; and (c) the LCD product manufacturer then sold the product. To estimate damages on these purchases, Prof. Marx adopts Prof. Bernheim's opinion that pass-through by LCD product manufacturers was 100 percent and makes a theoretical argument that pass-through by LCD product distributors was 100 percent. But like Prof. Bernheim, Prof. Marx ignores pass-through by the product assembler that purchased the LCD panel.

i. Prof. Marx's analysis of pass-through by LCD product distributors

193. Prof. Marx addresses pass-through by LCD product distributors who "competed with manufacturers for sales to resellers."[176] Figure VI.2 shows the position of these distributors in the LCD product supply chain. They purchased LCD products from manufacturers and resold them to resellers (other distributors and retailers). Thus, Prof. Marx addresses downstream pass-through by LCD product distributors, which is also upstream pass-through to other distributors and retailers (i.e., LCD product resellers).

[176] Marx BrandsMart Report, June 13, 2013, ¶41.

Figure VI.2: Prof. Marx's Analysis of Pass-Through by LCD Product Distributors



194. Prof. Marx's analysis of pass-through by LCD product distributors amounts to the following: (1) Prof. Bernheim finds that pass-through by LCD product manufacturers is 100 percent; (2) LCD product prices fell over the relevant period; (3) therefore, pass-through by LCD product distributors must have been 100 percent; otherwise, the distributors would not have been able to compete with the LCD product manufacturers who were passing through cost decreases to their customers.

195. Prof. Marx's logic is flawed. While we agree that pass-through by LCD product distributors likely is close to 100 percent on average, it is primarily because of competition among LCD product distributors, not competition from LCD product manufacturers. When LCD product retailers purchase from LCD product distributors, it is often because they cannot acquire the product from the manufacturer or the manufacturer has contracted with a

distributor to distribute the product for them, not because the distributor has won a head-to-head competition with the manufacturer.[177,178]

ii. Application of Prof. Marx's pass-through analysis downstream

196. Prof. Marx adopts Prof. Bernheim's analysis of pass-through by LCD product manufacturers. We report estimates of pass-through by LCD product manufacturers, distributors, retailers, and wireless carriers using Prof. Bernheim's regression equations in Exhibits VI.3 – VI.14. Nearly every estimate is 100 percent or greater. If one were to adopt Prof. Bernheim's pass-through analysis, as Prof. Marx does, damages on indirect purchases would be zero or very close to zero for LCD product distributors.

iii. Prof. Marx's estimates of volume of commerce

197. Prof. Marx estimates indirect volume of commerce and damages for the following plaintiffs: ABC Warehouse; BrandsMart; Circuit City; CompuCom; MARTA; MetroPCS; Office Depot; P.C. Richard; Tech Data; and Tweeter.

198. Prof. Marx estimates each plaintiff's indirect volume of commerce using the plaintiff's transaction-level purchase data. She estimates the number of units of LCD products purchased, adjusts the units by the alleged conspirator panel share, and multiplies by the median price of the relevant panel.

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[177] Deposition of Dan Schuh, ABC Warehouse 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-cv-04119-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, November 15, 2012, p. 194:14-24.

> Q. Do you ever buy the same product from two different suppliers? A. I suppose it's possible. Q. What kind of situation would that occur in? A. An example might be between a distributor and the actual manufacturer. Manufacturer doesn't have the product available to ship, but the distributor, who is an authorized distributor for the manufacturer, does have the product available to ship."

[178] Deposition of Richard Wallace, BrandsMart 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-CV-03763-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, January 16, 2013, p. 157:9-12.

> A. In the TV world, we didn't buy from a distributor. In this case for HP TVs, we did because HP did not sell us direct in TVs. They went through the same distributor called New Age.

199. We have been asked to review Prof. Marx's estimates of each plaintiff's indirect volume of commerce. Prof. Marx uses the same data and methods as Prof. Bernheim. As such, Prof. Marx makes the same errors that Prof. Bernheim makes. Prof. Marx also includes mobile phone purchases in her damages estimates for P.C. Richard even though P.C. Richard does not claim damages on mobile phone purchases.[179] Finally, counsel instructed Prof. Marx in the Tech Data case not to include purchases from non-manufacturers (e.g., distributors and wireless carriers).[180] We therefore assume that the plaintiffs are not seeking to recover damages on purchases from non-manufacturers in the Tech Data case, and so we do not include them in our damages estimates.

D. Dr. Snow's Report

i. Dr. Snow's analysis of pass-through to Syntax Brillian

200. Dr. Snow addresses pass-through by Taiwan Kolin, an LCD product assembler, to Syntax Brillian, an LCD product manufacturer. Figure VI.3 shows the position of Taiwan Kolin in the LCD supply chain. It purchased inputs, including LCD panels, assembled LCD televisions, and then sold the televisions to Syntax Brillian. Thus, Dr. Snow addresses downstream pass-through by Taiwan Kolin, which is upstream pass-through to Syntax Brillian. Dr. Snow does not address downstream pass-through by Syntax Brillian. Dr. Snow

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[179] Tietjen, Robert, Letter to Emmet Ong, Re: P.C. Richard Long Island Corp., et al. v. AU Optronics Corp., et al. 11-cv-04119-SI (N.D. Cal.), October 7, 2013; Marx Deposition, October 9, 2013; pp. 34:23 - 35:11.

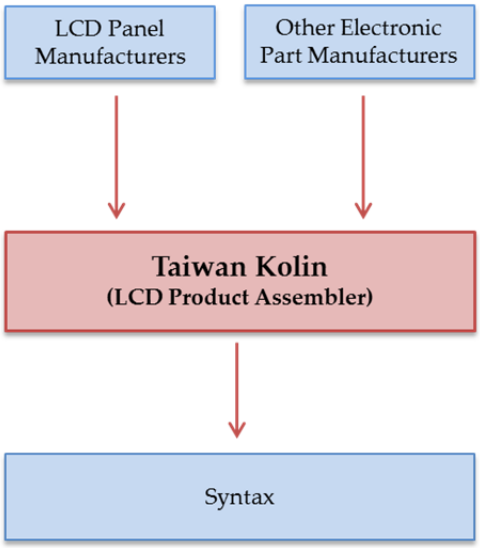
> Q. So is it your understanding that mobile phone purchases should not be included in your Figures 13 and 14 in Appendix D of the P.C. Richard report? A. My understanding in producing the report was that I was to include them. I see what you're pointing to here. And if it is not appropriate for me to include the mobile phones in the calculations, it would not be a problem to make that adjustment. So I would want to understand this and make whatever adjustment is appropriate.

[180] Marx Deposition, October 9, 2013, pp. 239:21-240:5.

> Q. Why did you not calculate damages arising from these distributors when they were in the data? […] A. I was given from counsel the list of suppliers to consider, and I took that as an instruction from counsel. And so I don't -- I took it as an instruction from counsel that that was the calculation I was being asked to perform.

has testified, however, that Syntax Brillian operated in a competitive market and that 100 percent pass-through by Syntax Brillian would be consistent with that.[181]

Figure VI.3: Prof. Snow's Analysis of Pass-Through by Taiwan Kolin to Syntax



201. Dr. Snow was instructed by counsel to assume 100 percent pass-through to Syntax Brillian, and was asked to consider whether there is evidence consistent with the assumption of 100 percent pass-through to Syntax Brillian.

202. Dr. Snow finds that the economic structure of the LCD product assembly sector is consistent with 100 percent pass-through. He also finds that there are data and evidence that are consistent with 100 percent pass-through.

203. Dr. Snow's "methodology" is highly suspect. Receiving an instruction from counsel to assume 100 percent pass-through and then looking for evidence that validates the

[181] Snow Deposition, October 10, 2013, p. 209:6-18.

> Q. You would expect, given that your understanding is that the manufacturing sector to which Syntax belongs is highly competitive – you would expect, based on economic theory, that Syntax would have passed on a hundred percent of any overcharges it received from Kolin in turn to its own customers. Is that a fair statement? A. No. I can't say that I would expect it. All I can say is it – it would be completely consistent…with the fact it's operating in a highly competitive environment.

assumption is not a good approach. If Dr. Snow's opinion is that pass-through by Taiwan Kolin is 100 percent, he should offer that opinion.[182]

ii. Dr. Snow's estimate of volume of commerce

204. Dr. Snow estimates Syntax Brillian's indirect volume of commerce using Syntax Brillian's transaction-level purchase data. Dr. Snow estimates the number of units of LCD products that Syntax purchased from non-alleged conspirators and affiliates, assumes that 100 percent of the LCD panels in those LCD products were supplied by alleged conspirators or alleged affiliates, and multiplies by the median price of the relevant panel. It is our opinion that Dr. Snow's calculation of Syntax's indirect volume of commerce from July 2004 – April 2006 accurately reflects the purchase data Syntax produced. However, Dr. Snow includes purchases after April 2006 in his volume of commerce estimate even though he states that his analysis is limited to the July 2004 – April 2006 period.[183] We exclude purchases after April 2006 in our estimate of Syntax's volume of commerce.

E. Prof. Blair's Report

205. Prof. Blair has submitted a report for one of the plaintiffs, TracFone. In this report, Prof. Blair estimates panel overcharges, pass-through by mobile telephone handset manufacturers to TracFone, pass-through by TracFone, volume of commerce for TracFone's direct and indirect purchases, and damages to TracFone on its direct and indirect purchases.

i. Prof. Blair's analysis of pass-through to and by TracFone

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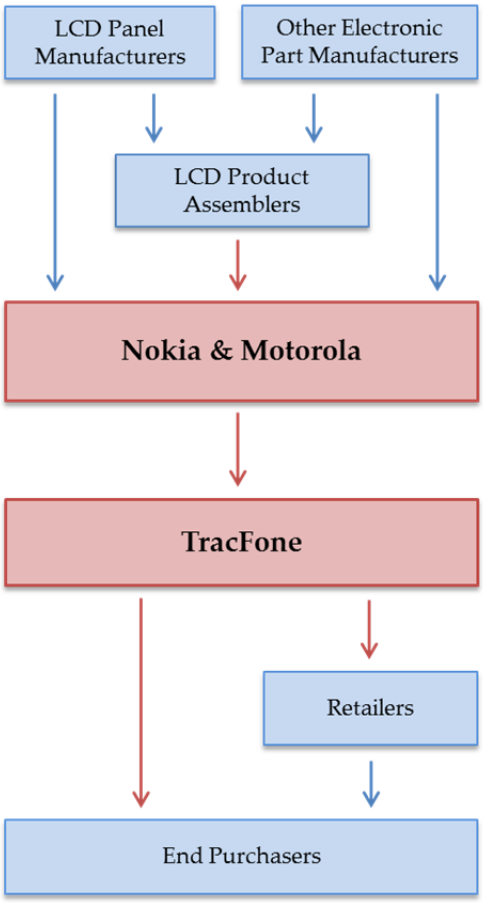
[182] Dr. Snow testified that he lacked adequate data to estimate pass-through by Taiwan Kolin. See Snow Deposition, October 10, 2013, p. 192:3-16.

> Q. So, independently, you haven't attempted to quantify or measure the impact of price reductions on the prices charged by Kolin to Syntax. Fair statement? A. I have attempted to do so, but have not. Q. You have – Okay. So, you start off with this attempt to compute something, but you're unable to do so? A. Right. Q. All right. Why? A. Because it's – With the data available, it wasn't possible to tie the rebates to particular products. They appear as just lump sums."

[183] Snow Report, ¶9 ("My analysis focuses on the period July 2004 through April 2006.").

206. TracFone is a prepaid wireless carrier. It purchases mobile telephone handsets from handset manufacturers and sells the handsets to retailers and wireless minutes to consumers who purchase the handsets from the retailers. Figure VI.4 shows the relevant LCD product supply chain.

Figure VI.4: Prof. Blair's Analysis of Pass-Through To and By TracFone



207. Prof. Blair estimates pass-through by handset manufacturers Motorola and Nokia to TracFone and competing wireless carriers, and pass-through by TracFone into handset prices. Motorola purchased from assemblers some of the handsets that it sold to TracFone.[184] On those purchases, the amount of any overcharge that reached TracFone depends on pass-through by the assemblers and Motorola. Prof. Blair does not estimate

[184] Stokes, Joshua, Letter to Derek Foran, Re: In re TFT-LCD (Flat Panel) Antitrust Litigation, Case No. M07-1827 SI, 2013, November 11, 2011; "ODM Phone Purchase Data - Moto00474365 - Highly Confidential.xls."

pass-through by handset assemblers to Motorola though. Consequently, in cases where Motorola purchased from an assembler the handsets that it sold to TracFone, Prof. Blair cannot determine the amount of any overcharge that reached TracFone.

208. Prof. Blair does not estimate pass-through by TracFone into wireless minute prices. Prof. Blair reports an estimate of 179 percent pass-through by handset manufacturers to TracFone and competing wireless carriers and 21 percent pass-through by TracFone into handset prices. In this section, we discuss Prof. Blair's analyses of upstream and downstream pass-through. We explain that Prof. Blair overestimates upstream pass-through (i.e., pass-through by Motorola and Nokia to TracFone and competing wireless carriers) and underestimates downstream pass-through (i.e., pass-through by TracFone).

209. To begin, the combination of 179 percent pass-through to TracFone and 21 percent pass-through by TracFone is inconsistent with the economics of the handset supply chain and with the testimony of TracFone's representatives.

210. First, according to TracFone, it passes changes in handset costs through to retailers. The below is an excerpt from the deposition of Jim Ruth, Senior Product Officer at TracFone:[185]

> Q. When the price that TracFone pays a manufacturer for an LCD product decreases, does TracFone always lower the price it charges to a retailer?
>
> A. I believe so. I believe that's correct.
>
> Q. What would you say is the primary driver of the price [that TracFone charges for handsets]?
>
> A. Cost.
>
> Q. And is that the cost to TracFone?
>
> A. Correct.

[185] Deposition of Jim Ruth, Tracfone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL 1827, United States District Court, Northern District of California, San Francisco Division, September 13, 2011, p. 165:13-18 and pp. 145:22-146:1.

Prof. Blair's estimate that TracFone's pass-through rate is 21 percent implies that when the price that TracFone pays for a handset goes down by $1, TracFone reduces the price that it charges retailers for the handset by $0.21. A pass-through rate of 21 percent is not consistent with Mr. Ruth's testimony that cost is the "primary driver of the price."[186]

211. Furthermore, according to TracFone, Motorola and Nokia reduced the handset prices that they charged TracFone because TracFone would pass those price reductions on to retailers. The below is an excerpt from the deposition of Robert Dandrea, Executive Vice President of Sales and Marketing at TracFone:[187]

> A. One of the reasons why we were successful in getting the lower costs is because we typically always passed those through to lower the manufacturer suggested retail price so that it would drive the right behavior for the manufacturer and ourselves, which was to sell more products.

This makes sense. Motorola and Nokia want TracFone to reduce handset prices because more handsets are sold at lower prices. During the relevant period, Motorola and Nokia's panel costs decreased. Prof. Blair's estimate of 179 percent pass-through by Motorola and Nokia, therefore, implies that Motorola and Nokia more than fully passed these cost decreases on to TracFone. And, according to TracFone, Motorola and Nokia did this because TracFone would then pass lower handset prices on to retailers who would then pass lower handset prices on to consumers. Prof. Blair's estimate of 21 percent pass-through by TracFone is inconsistent with this logic. It would imply that TracFone absorbed the vast

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186 Prof. Blair's estimated pass-through rate of 21 percent is also at odds with Prof. Marx, another of the plaintiffs' experts. Prof. Marx's opinion is that wireless carrier pass-through is 100 percent. See, for example, Marx Deposition, October 9, 2013, pp. 220:16-221:5, and 222:20-223:1.

> Q. So do you recall in your previous deposition you stated that, quote: Wireless carriers, going from their purchases of mobile phones to their sales to large resellers, such as the plaintiffs, they would have pass-through 100 percent of variations in cost in the range of that? […] A. I agree.
>
> Q. And if you had included, for example, in your Target calculations, purchases from the wireless carrier TracFone, you would have applied a 100 percent pass-through rate to that purchase from TracFone, correct? […] A. That's correct.

187 Deposition of Robert Dandrea, Tracfone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL 1827, United States District Court, Northern District of California, San Francisco Division, September 19, 2012, p. 95:16-21.

majority of Motorola and Nokia's price reductions. But if this is what TracFone did, Motorola and Nokia presumably would not have provided the price reductions in the first place.

212. What to make, then, of Prof. Blair's estimate of 179 percent pass-through to TracFone and 21 percent pass-through by TracFone? In short, Prof. Blair overestimates pass-through by handset manufacturers to TracFone using one econometric approach and then underestimates pass-through by TracFone using a different econometric approach. The approaches are incorrect and internally inconsistent.[188]

213. First, Prof. Blair overestimates pass-through to TracFone. His estimate of 179 percent pass-through is biased upward. We explain in the section that follows that Prof. Blair does not control for the effect of the product life cycle on the prices that Motorola and Nokia charged TracFone and does not fully control for changes in the costs of manufacturing handsets.

214. Second, Prof. Blair underestimates pass-through by TracFone. His estimate of 21 percent pass-through into handsets is biased downward. He uses data with significant measurement error and does not adjust his econometric specification accordingly and he makes mistakes in the handling of these data. Furthermore, Prof. Blair does not account for the possibility that TracFone passed handset costs through to the prices of its wireless minutes.[189] Handsets are an input that TracFone uses to produce wireless coverage.[190] To

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[188] To estimate handset manufacturer pass-through to TracFone, Prof. Blair uses variation in panel cost and ignores variation in the costs of other components. To estimate pass-through by TracFone, Prof. Blair uses variation in total handset cost.

[189] Deposition of Roger Blair, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, October 18, 2013, (hereafter Deposition of Roger Blair, October 17-18, 2013), pp. 246:24-247:16.

> Q. …Well, let me see, would you agree with this statement: If, in fact, TracFone did pass on changes in handset costs through changing the price of airtime minutes, then your pass-through analysis likely would be biased downward, would you agree with that statement? A. Okay. So you're asking me, if, in fact, they passed on what I observed in the handset prices and also passed on some of the cost of the handset in other ways, you're asking me would I agree -- I missed the end. Q. Do you agree that your estimate of TracFone's pass-through is biased downward, sir? A. Oh, okay. I'm sorry, I got it. Yes.

determine how much TracFone was damaged on its handset purchases, a relevant question is the extent to which TracFone would have passed through increases in handset costs to the prices of wireless coverage. Taken at face value, Prof. Blair's estimate of 21 percent pass-through into handset prices simply indicates that TracFone would have passed but a small percentage of overcharges through to handset prices; it says nothing about the extent to which TracFone would have passed overcharges through to the prices of wireless minutes. Ignoring pass-through into wireless minutes likely will understate the extent to which TracFone would have passed through any overcharges, and hence, overstate the extent to which TracFone was damaged on its handset purchases.

215. Finally, Prof. Blair incorrectly attributes his low estimate of TracFone's pass-through into handset prices to TracFone's practice of selling handsets below acquisition cost.[191] TracFone sells handsets at prices that are below the costs that it pays to acquire the handsets and attempts to recoup these subsidies through sales of wireless minutes.[192] For example, if TracFone pays $100 to acquire a given handset, it might then charge $50 for the handset. Contrary to Prof. Blair's assertion, this type of business practice does not mean that TracFone's pass-through rate would be low. TracFone's pass-through rate reflects how TracFone changes the prices it charges in response to changes in the prices it pays. This is different from the absolute difference between the price TracFone charges and the price TracFone pays for a handset at a point in time. Returning to the example above, suppose

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190 América Móvil Form 20-F, July 2, 2001, For Fiscal Year Ended December 31, 2000, F-12, ("TracFone Wireless, Inc. (TracFone) resells cellular airtime on a prepaid business through retailers to customers who use telephones equipped with TracFone's software. TracFone does not own cellular infrastructure but purchases airtime from carriers throughout the United States. Revenues derived from the sale of cellular telephones are incidental to TracFone's main business of reselling cellular airtime.")

191 Blair Declaration, June 6, 2013, p. 39 ("This section includes descriptive evidence of TracFone's practice of selling their handsets below cost… This provides supporting evidence of the finding of the low pass through rate.")

192 Deposition of Richard Dobrinsky, TracFone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, September 19, 2012, p. 88:2-5.

> Q. And TracFone keeps its phone prices below its costs because it expects to make its profits in airtime sales; is that right? A. Yes.

that the price TracFone pays to acquire a given handset increases from $100 to $105 and TracFone then increases the price it charges for the handset from $50 to $55. TracFone's pass-through rate into handset prices would be 100 percent even though TracFone is pricing the handset at $50 below its acquisition cost.

ii. Pass-through to TracFone

a. Econometrics

216. Prof. Blair evaluates pass-through to TracFone by estimating the effect of *panel* acquisition cost on *handset* price for handset manufacturers, Motorola and Nokia. His econometric specification is the following:

$$P_{it} = \alpha + \beta * c_{it} + \delta_i + \kappa_j + \tau_y + e_{it},$$

where P_{it} is the volume-weighted quarterly average price of handset i in quarter/year t,[193] c_{it} is the volume-weighted quarterly average acquisition cost of the panel in handset i in quarter/year t,[194] δ_i is a handset fixed effect,[195] κ_j is a purchaser fixed effect,[196] and τ_y is a year fixed effect.[197]

217. In the equation above, the handset fixed effect controls for unobserved handset quality; the purchaser fixed effect controls for any fixed differences across purchasers in the prices that they paid for handsets; the year fixed effect controls for any fixed differences across years in the prices of handsets.

218. Prof. Blair's econometric specification has two major problems.

219. First, Prof. Blair's specification relates changes in the price of a handset to changes in the acquisition cost of a panel, but does not control for changes in the costs of the other

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193 This is the price Motorola or Nokia charged for the handset.

194 This is the price that Motorola or Nokia paid for the panel.

195 There are ten unique handset models in the data that Prof. Blair analyzes.

196 Purchasers include, among others, TracFone, AT&T, Cingular, Cincinnati Bell, Cricket, Verizon Wireless, Brightpoint, PCS, 7-Eleven, and Circle-K.

197 Years covered are 2001 through 2008.

components that are needed to make handsets. This is a problem because changes in panel acquisition costs are positively correlated with changes in the costs of these other components.[198] This means that changes in the costs of the other components show up as "shocks" embodied in e_{it}. The result is that Prof. Blair's specification attributes to panel cost, changes in price that were caused by changes in the costs of other components used to make handsets. This causes Prof. Blair's estimate of pass-through to TracFone to be biased upward.[199]

220. Second, Prof. Blair's specification does not control for product life cycles. Over the life cycle of a handset, demand weakens and this leads to price decreases. This shows up as a negative "shock" embodied in e_{it}. This weakening of demand coincides with—is correlated with—decreases in the cost of making the handset. But in specifying this equation Prof. Blair incorrectly assumes that the weakening of demand is uncorrelated with decreases in cost over the life cycle. The result is that Prof. Blair's specification incorrectly attributes to cost, changes in price that were caused by changes in demand. And this causes Prof. Blair to overestimate pass-through to TracFone.

b. Data

221. Prof. Blair uses LCD panel purchases data and handset sales data provided by Motorola and Nokia. The panel purchases data are invoice-level records of LCD panel purchases. The handset sales data are invoice-level records of handset sales. The panel purchases and handset sales data were produced by Motorola and Nokia in separate files and so Prof. Blair must merge the data himself. It is almost inevitable that this results in mismatched price-cost data. (See discussion in Section V.)

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198 See Exhibit VI.15.

199 Suppose, for example, that panel cost changes by $1, other component costs change by $3, and price changes by $2 in response. Prof. Blair's specification will estimate a pass-through rate of 200 percent (=$2/$1), whereas the actual pass-through rate is 50 percent (=$2/$4).

c. Corrections to Prof. Blair's upstream pass-through analysis

222. We make two corrections to Prof. Blair's analysis of pass-through to TracFone: (1) we regress handset price on handset cost rather than panel cost; and (2) we control for the amount of time that a handset has been on the market. With these two corrections alone, the estimate of pass-through to TracFone is 32 percent. (See Table VI.3 below.) This is more than 100 percentage points lower than Prof. Blair's estimate of pass-through to TracFone.

223. The estimated pass-through rate of 32 percent is likely biased downward by the attenuating effects of measurement error. The handset price and handset cost data that we use to correct Prof. Blair's analysis were produced by Motorola in separate files.[200] The handset price data are the data that Prof. Blair uses. We have to match these data to handset cost data. This process is inherently imprecise. Measurement error likely results from this imprecision, which causes pass-through estimates to be less accurate. In our analysis of pass-through to TracFone, we do not rely on these estimates. Instead, we use monthly handset revenue, quantity, and manufacturing cost data that were produced together by Motorola and do not require manual matching. Using these more reliable data, our estimate of pass-through to TracFone is 104 percent. This estimate is 75 percentage points lower than Prof. Blair's estimate of pass-through to TracFone. Prof. Blair's estimate of pass-through to TracFone is wildly inaccurate.

[200] Prof. Blair uses Motorola and Nokia data to estimate pass-through to TracFone. Nokia did not produce data that could be used to measure the total cost of manufacturing handsets.

Table VI.3
Sensitivities to Prof. Blair's Analysis of Pass-Through to TracFone

Specification	Pass-Through to TracFone
Prof. Blair's specification	179%
Restrict to sample for which handset costs are available	131%
Substitute handset costs for LCD panel costs	35%
Substitute handset costs for LCD panel costs and add time-on-market fixed effects	32%

Notes:
[1] Prof. Blair calculates the quarterly average price that a given handset manufacturer (Motorola or Nokia) charged a given handset purchaser (e.g., TracFone) in a given quarter. He also calculates the average price that a given handset manufacturer (Motorola or Nokia) paid for LCD panels in a given quarter. He regresses the average handset price charged by the handset manufacturer on the average panel price paid by the handset manufacturer, a handset model fixed effect, a purchaser fixed effect, and a year fixed effect.
[2] Prof. Blair restricts his sample to handset models that TracFone purchased from Motorola and Nokia.
[3] Handset cost data are available for Motorola but not for Nokia.
[4] Exhibit VI.16 reports numbers of observations and standard errors.

Sources:
[1] Backup Production to Declaration of Prof. Roger D. Blair, Ph. D., June 6, 2013.
[2] Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph. D., June 13, 2013.

iii. Pass-through by TracFone

a. Econometrics

224. Prof. Blair regresses the average price that TracFone charged a given customer for a handset model in a given quarter on the average price that TracFone paid to acquire that handset model in that same quarter. His econometric specification is the following:

$$P_{ijt} = \alpha + \beta * C_{it} + \delta_i + \kappa_j + \tau_y + \phi_q + \zeta_b + \xi_s + \omega_c + e_{ijt},$$

where P_{ijt} is the volume-weighted quarterly average sale price of handset i to customer k in quarter/year t, C_{it} is the volume-weighted quarterly average acquisition cost of the handset i in quarter/year t, δ_i is a handset fixed effect, κ_j is a purchaser fixed effect, τ_y is a year fixed effect, ϕ_q is a calendar quarter fixed effect, ζ_b is a "Net10 brand" fixed effect, ξ_s is a panel-type fixed effect, and ω_c is a screen technology fixed effect.

225. In the regression equation above, the "Net10 brand" fixed effect, panel-type fixed effect, and screen technology fixed effect are subsumed by the handset fixed effects and can be ignored (i.e., omitted from the estimating equation).[201] They have no impact on Prof. Blair's analysis. Thus, Prof. Blair's econometric specification can be simplified as follows:

$$P_{ijt} = \alpha + \beta * C_{it} + \delta_i + \kappa_j + \tau_y + \phi_q + e_{ijt},$$

where P_{ijt} is the volume-weighted quarterly average sale price of handset i to customer j in quarter/year t, C_{it} is the volume-weighted quarterly average acquisition cost of the handset i in quarter/year t, δ_i is a handset fixed effect, κ_j is a purchaser fixed effect, τ_y is a year fixed effect, and ϕ_q is a calendar quarter fixed effect.

226. This specification does not control for the wireless minute revenue that TracFone expected the handset sale to generate. According to TracFone's Vice President of Sales and Marketing, Robert Dandrea, the difference between the price that TracFone would charge for a handset (P_{ijt} in the equation above) and the price that TracFone would pay to purchase that handset (C_{it} in the equation above) was determined by the revenue from wireless minute sales that TracFone expected from the handset sale.[202] That is, conditional on the price that TracFone paid to purchase a handset (C_{it} in the equation above), the expected revenue from wireless minute sales determined the price that TracFone charged for the

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[201] These fixed effects cannot be estimated simultaneously with the full set of handset fixed effects because they never vary within individual handset models. Prof. Blair selectively omits some of the handset fixed effects from his regression so that he can include the "Net10 brand" fixed effect, the panel-type fixed effect, and the screen technology fixed effect. This omission affects the estimated handset fixed effects, but does not (and mathematically cannot) affect the estimated pass-through rate (this calculation is performed in the backup materials to this report).

[202] Deposition of Robert Dandrea, TracFone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL 1827, United States District Court, Northern District of California, San Francisco Division, September 19, 2012, p. 81:1-13.

> Q. How do you figure out what subsidy you would use for the handset model? A. So we would work with financial planning to ensure that the amount of the subsidy, that the net result of when you sold that phone and the number of months that customer would use that phone, that the revenue from that customer on that phone would not only cover the cost of that subsidy, but also provide profit, if you will, or additional revenue to our company.

handset (P_{ijt} in the equation above). If TracFone expected a handset sale to generate more wireless minute revenue, it could charge a lower price for the handset, all else equal.

227. Prof. Blair's regression model, therefore, omits a factor that affected the prices that TracFone charged for handsets. This is a problem because expected wireless minute revenue and handset acquisition cost are likely to be positively correlated. Motorola and Nokia want TracFone to charge low handset prices so that they can sell more handsets. Lower expected wireless minute revenue puts upward pressure on TracFone's handset prices. Such upward pressure, in turn, may induce Motorola and Nokia to reduce handset prices because they want TracFone to keep its handset prices down. TracFone's handset acquisition costs, consequently, may be positively correlated with TracFone's expected revenue from wireless minutes; lower handset acquisition costs may be associated with lower expected revenue from wireless minutes. Thus, if expected revenue from wireless minutes is not modeled, the estimated effect of acquisition cost on handset price may be biased downward. The estimate would reflect the combined effect of handset cost on handset price *and* the effect of expected wireless minute revenue on handset price.[203]

b. Data

228. Prof. Blair uses TracFone's purchases and sales data to estimate TracFone's pass-through into handset prices. The sales data are invoice-level records of TracFone's sales of Motorola and Nokia handsets over the 2003 through 2008 period.[204] The purchases data are invoice-level records of TracFone's purchases of handsets from Motorola and Nokia over the 2001 through 2010 period.[205] In what follows below, we explain that these data are not reliable. We also describe mistakes that Prof. Blair makes in handling these data.

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[203] The expected effect of handset cost on handset price is positive. The expected effect of expected wireless minute revenue on handset price is negative. The combined effect, therefore, is expected to be lower than the expected effect of handset cost on handset price.

[204] 2006_thru_2008_Phones_Sales_-_Legal_FINAL.XLSX

[205] JDG01583716.xlsx

TracFone's purchases and sales data are not reliable

229. ***There are duplicate entries in TracFone's handset purchases data.*** Prof. Blair uses TracFone's purchases data to estimate the average prices that TracFone paid to acquire handsets at different points in time. The problem is that TracFone's purchases data have duplicate entries, and so it is not possible to determine what TracFone actually purchased at different points in time.

230. In some cases, data entries that appear to be duplicates have the same invoice numbers and invoice dates, but different transaction dates. For example, the invoice number "220282676" appears in 31 rows of the data; each of these 31 rows indicates that TracFone purchased 5,000 units of the Nokia 5125 handset. In other cases, what appear to be duplicates have different invoice numbers and invoice dates, but the same numbers of units purchased. For example, the data show that TracFone purportedly purchased 11,277 units of the Motorola V171 handset one hundred separate times (i.e., through one hundred separate invoices).

231. TracFone recognized that duplicate entries are a problem and even produced a supplemental purchases file.[206] This supplemental file, however, does not include information on unit prices or quantities, and the information on handset model type is incomplete. It cannot be used to estimate TracFone's pass-through.[207]

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[206] Deposition of Martha Rivera, Tracfone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL 1827, United States District Court, Northern District of California, San Francisco Division, pp. 39:22-40:8.

> Q. Did anybody check the handset purchase data that was reflected -- that was produced to ensure that it didn't have duplicate entries? A. There was an original file that was incorrect, and then the second file was -- there was an original file produced in January. I don't know if you saw that or not, and then it was later corrected. Q. Did the original file have duplicate entries? A. Yes.

[207] Prof. Blair, for example, does not use the data. Moreover, approximately 8 percent of the invoices in these data are not in the file that Prof. Blair relies on, and 21 percent of the invoices in the file that Prof. Blair relies on are not in these data. This raises further questions about the completeness and reliability of the data that TracFone produced.

232. Prof. Blair also recognized that duplicate entries are a problem and attempted to remove them using a "screening algorithm."[208] But Prof. Blair's screening algorithm does not work. After Prof. Blair applies his screening algorithm, for example, there are still 100 rows in the data where TracFone supposedly purchased 11,277 units of the Motorola V171. These 100 rows alone would sum to more than three times the number of units of the Motorola V171 that TracFone sold.[209,210]

233. Professor Blair's screening algorithm is also based on a misunderstanding of TracFone's data. Prof. Blair claims that the duplicates occur because "the total quantity of handsets ordered may be partially filled on separate transactions in which case the transaction records repeat until the order is filled."[211] If this were the only reason for duplicate entries though, only one of the 100 purchases of 11,277 units of the Motorola V171 would remain in the data after his algorithm is applied. Instead, it appears that the data have different types of duplicate entries. Sometimes the same invoice number is recorded multiple times. Other times it appears that the same transactions are recorded under different invoice numbers and dates.

234. ***TracFone's sales data are incomplete.*** TracFone's sales data are missing all sales information for January 2003, September 2003, and May 2005. Some of the patterns of transactions in the data are also strange. There are, for example, 53,602 separate sales transactions in December 2005, but only 207 in December 2006. This suggests that the data

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208 Blair Declaration, June 6, 2013, footnote 76 ("The transactions data may contain multiple records for a single invoice… I applied a screening algorithm to remove repeat records.")

209 Prof. Blair's screening algorithm flags as "duplicates" rows of data where the purchase document number, invoice number, invoice date, item number, and quantity billed are the same. Prof. Blair keeps the first row of each set of "duplicates" and drops the other rows. Within any group of "duplicate" rows, however, the quantity of *units received* may differ. (Prof. Blair uses units received not quantity billed to estimate the number of units that TracFone purchased.) The application of Prof. Blair's screening algorithm can result in different estimates of the number of units that TracFone purchased depending on how the rows within sets of "duplicates" are ordered. In 2005, for example, TracFone could have purchased between 5,025,234 and 8,508,924 units according to Prof. Blair's screening algorithm.

210 This calculation appears in the backup materials to this report.

211 Blair Declaration, June 6, 2013, footnote 76.

may be recorded at a transaction level for some periods (e.g., December 2005) and at a more aggregate level for other periods (e.g., December 2006).

235. ***TracFone's handset sales data do not include information on handset acquisition costs.*** TracFone's sales data have the prices that TracFone charged for handsets in given transactions, but not what TracFone paid to acquire those handsets. Prof. Blair, consequently, must use TracFone's handset purchases data to estimate what TracFone paid to acquire the handsets in TracFone's sales data. He attempts to do this by estimating TracFone's average sale price in a given quarter using the handset sales data and calculating TracFone's average handset cost in a given quarter using the handset purchases data, and merging the quarterly average prices with the quarterly average acquisition costs. Prof. Blair states that this approach assumes a turnover cycle of no more than three months; that is, that TracFone sold handsets within three months of acquiring them.[212] Prof. Blair is wrong about the assumption that he makes. His approach assumes that TracFone purchased and sold handsets in the same quarter. If, in fact, TracFone's turnover cycle was no more than three months, a substantial portion of TracFone's handsets likely would have been purchased and sold in different quarters. For example, if TracFone's turnover cycle was two months on average, two thirds of TracFone's handsets would have been purchased and sold in different quarters. This would mean that a substantial portion of Prof. Blair's price and acquisition cost data are mismatched.[213]

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[212] Blair Declaration, June 6, 2013, ¶123.

[213] Deposition of Roger Blair, October 17-18, 2013, pp. 124:11-125:25.

> Q. Let me ask a question to see if I understand this. If a purchase of a handset was made in one quarter but the corresponding sale of that handset occurred in the next quarter, the purchase and sale would not be matched in the same quarter based on your analysis; is that correct? A. Yes, that's correct. Q. Okay. So with a turn over cycle of three months, wouldn't you suspect that a substantial portion if not all of the purchases and sales would be across financial quarters in that way? A. They could be. Q. All right. If that's the case, then a substantial portion of your combined data set, this merged data that you're using, is not, in fact, matching the purchase of a product to the sale of that product; isn't that a fair statement? A. To the extent that there's variances between the purchase quarter and the sale quarter, you know, then they don't match. As I'm sitting here today, I can't tell you the frequency of that. Q. All right. Nor can you exclude

Prof. Blair makes data processing mistakes

236. ***Prof. Blair does not identify handset models correctly when he calculates the average prices and costs of TracFone's handsets***. The TracFone data include a field that identifies unique handset models with up to nine digit alphanumeric codes (e.g., "TFMTW370"). But Prof. Blair only uses the first six digits of these codes.[214] The problem is that the digits that Prof. Blair ignores are necessary to identify unique handset models (e.g., Prof. Blair ignores the digits that are necessary to distinguish between the Motorola handsets "TFMTW370" and "TFMTW376").[215,216] Because he does not identify unique handset models correctly, Prof. Blair's estimates of the average prices and costs of those handset models are not accurate.[217]

237. ***Prof. Blair does not identify customers correctly in TracFone's sales data.*** Prof. Blair claims to identify sales to "40 unique customers and one category consisting of about 10 smaller

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the possibility that a substantial number of the purchases and sales that you have in that matched database are not in fact matched? A. As I sit here right now, I can't respond to that.

214 Prof. Blair's computer program assigns each variable the maximum number of characters that appear in the first 20 rows of the raw data file. Because the first 20 rows of Prof. Blair's raw data contain model numbers that are six characters, his computer program forces *all* models in the data to have six characters.

215 For example, the W376 has a camera, Bluetooth capability, and better graphics than the W370.

216 If we correct only the lines of Prof. Blair's computer code that read in the raw data files so that the entire "model" field appears in the data, his pass-through estimate more than doubles to 44 percent. This calculation is included in the backup materials of this report.

217 Deposition of Roger Blair, October 17-18, 2013, pp. 275:8:-276:12.

Q. If that's true that some of the models have eight digits, do you understand that the last two digits in that eight digit model number could contain important information differentiating a model from another model? A. I would think that it could, yes. Q. And that if you used only the first six digits of a model number and two models, different characteristics had the same first six digits but different last two digits you may end up combining two different models, different characteristics into one model for purposes of your analysis; isn't that correct? A. Yes, that's correct. Q. So why did you use only the first six digits of a model number if the last two digits of the eight digit model numbers contained differentiating information? A. As I sit here right now, I can't answer that question. Q. But if you were aware that in the backup data -- rephrase. If now you were aware that in the backup data there are eight digit model numbers, you would want to correct that mistake; is that correct? A. I would want to see if it made a difference, yes. Q. And if it does make a difference, you would want to correct that mistake, correct? A. Yes, that's correct.

buyers combined" and includes "customer fixed effects" in his econometric specification.[218] Prof. Blair's categorization of customers, however, is inconsistent and inaccurate. For example, he assigns some sales to Office Max and Office Depot to an "ALL OTHERS" customer category even though he has unique categories for both Office Max and Office Depot. Moreover, the customer category that he claims consists of "10 smaller buyers combined" actually contains over 80 different customers, and even includes CVS, TracFone's eighth largest customer by units purchased.

Prof. Blair's Exhibits 27-30 are very misleading

238. Prof. Blair claims that Exhibits 27-30 show that TracFone did not adjust handset prices when handset costs changed and he asserts that "[t]his business practice is the reason [his] econometric models correctly demonstrate low downstream pass through rates on handsets."[219] These exhibits are very misleading. Prof. Blair also testified in his deposition that they appear to be wrong.[220]

239. Exhibit 27 is intended to show that the price that TracFone charged Target for the Nokia 2600 handset did not change from the first quarter of 2005 through the first quarter of 2006 even though TracFone's acquisition cost decreased over those same quarters. To calculate the average price that TracFone charged for these handsets during this period, however, Prof. Blair excludes transactions where the prices were different from the price that he shows in the exhibit. This exclusion is unjustified. It gives a very misleading picture of how TracFone's prices responded to cost changes. It is analogous to a researcher in a clinical trial

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218 Blair Declaration, June 6, 2013, Exhibit 34.

219 Blair Declaration, June 6, 2013, ¶113.

220 Deposition of Roger Blair, October 17-18, 2013, pp. 237:14 -238:7.

> Q. Okay. Sir, if, in fact, Tracfone sold to Office Max V 170 handsets at prices less than $40 between the years 2005 through 2008, would you agree with me that your assertion in the expert report that the price Tracfone charged for Office Max was a $40 fixed price would be inaccurate? […] A. Well, I'd certainly want to look into it to make sure, but, you know, if what you are representing to me is correct and there is no explanation for these prices that are significantly lower than $40… I would have to agree that the… statement's inaccurate. So, I mean, it's obvious that if I say the price is constant and the facts are that it is not constant, then it's obvious that my statement is inaccurate. So I would concede that.

reporting the number of adverse drug reactions after removing the adverse drug reactions from the data. Prof. Blair, in effect, purports to show that TracFone's handset prices did not change after its acquisition costs changed by removing the data points that would have shown otherwise. When these data points are added back, the data show that TracFone's handset prices did change after its acquisition costs changed. In Exhibit VI.17, we reproduce Prof. Blair's Exhibit 27 without excluding the prices that were not equal to the prices chosen by Prof. Blair.

240. Consider also Exhibit 29. Like Exhibit 27, this exhibit is intended to show the price that TracFone charged Office Max for the Motorola V170 from the fourth quarter of 2005 through the fourth quarter of 2006. Not only did Prof. Blair exclude transactions where the prices were different from the price that he shows in the exhibit, but he also excluded other quarters from the data that show a much more complete picture of how TracFone's prices changed in response to cost changes. In Exhibit VI.18, we reproduce Prof. Blair's Exhibit 29, including all the relevant prices and not restricting the snapshot of data to the narrow time period Prof. Blair presented.[221] Not only does this exhibit paint a dramatically different picture of how TracFone's handset prices changed in response to cost changes, but a back-of-the envelope calculation based on this exhibit would suggest that TracFone passed through 92 percent of cost changes into handset prices.[222]

c. Corrections to Prof. Blair's downstream pass-through analysis

241. To correct Prof. Blair's downstream pass-through analysis, we would need to correct the problems with TracFone's handset purchases and sales data. This is not possible—we do not have a reliable way to eliminate duplicate entries in the purchases data or to match the prices that TracFone paid for handsets to the prices that TracFone charged for handsets. And because we cannot fix the problems with TracFone's data, we expect that econometric

[221] Exhibits 28 and 30 are flawed and misleading in the same ways as Exhibits 27 and 29.

[222] According to Exhibit VI.18, TracFone's acquisition cost decreased by $52 ($99 - $47), while TracFone's price decreased by $48 ($64 - $16). The pass-through rate is the change in price divided by the change in cost, or $48/$52 = 92 percent.

estimates of TracFone's pass-through of handset costs into handset prices *that use TracFone's data* will be biased toward zero, like Prof. Blair's 21 percent estimate.

242. In our opinion, the best way to correct Prof. Blair's downstream pass-through analysis is to use different data. TracFone's competitor, AT&T, produced handset price data that include handset acquisition costs. In these data, we know what AT&T paid to acquire handsets and we know what AT&T charged for those handsets. Compared to TracFone's data, these are great data. With our preferred specification, equation 3 of this report, the pass-through estimate is 76 percent. This estimate is substantially higher than Prof. Blair's 21 percent estimate.[223]

iv. Volume of Commerce

243. Prof. Blair uses TracFone financial statements to estimate TracFone's handset purchases before 2002. TracFone though has indicated that its financial documents cannot be used to estimate its handset purchases during this period without making various assumptions about non-handset costs.[224] Consequently, Prof. Blair's estimate of TracFone's handset purchases prior to 2002 is not reliable. We calculate TracFone's volume of commerce and damages both including and excluding the 2000-2001 time period. (See Appendix E.9.)

244. Prof. Blair estimates TracFone's volume of commerce using TracFone's transaction-level purchase data in 2002 and TracFone's monthly inventory data from 2003-2006. In our

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[223] Deposition of Roger Blair, October 17-18, 2013, pp. 266:12-24.

> Q. Both TracFone and AT&T sell their handsets to retailers and other customers at a discount in order to get their customers and consumers to purchase airtime; is that correct? A. Yes, that's my understanding, yes. Q. TracFone and AT&T both compete with other wireless providers for the same customers; is that correct? A. Yes, that's correct. Q. TracFone and AT&T compete against each other along with other wireless providers in a competitive market; is that correct? A. It's certainly rivalrous.

[224] Deposition of Martha Rivera, TracFone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL 1827, United States District Court, Northern District of California, San Francisco Division, p. 75:5-14.

> Q. …There's no way that the defendants in this case could figure out what the hand set purchase costs were from 1996 through 2001 without knowing what the freight and fulfillment and packaging costs were, right? A. Correct. Q. And that information was never provided to the defendants in this case, right, because you were the one who pulled the data, right? A. Correct.

opinion, Prof. Blair accurately estimated TracFone's unit purchases of handsets from 2003-2006, but overestimated the prices of the panels that were in those handsets.[225] Prof. Blair uses the average market-wide TFT and STN-LCD panel prices in DisplaySearch data to estimate the dollar value of TracFone's panel purchases. The problem is that TracFone generally purchased handsets with lower quality panels than the average TFT and STN-LCD panels recorded in DisplaySearch. Consequently, Prof. Blair likely overestimates the dollar volume of TracFone's panel purchases. We have corrected Prof. Blair's panel price estimates by estimating the average prices of TFT and STN-LCD panels with screen resolutions that most closely match the resolutions of the panels in the handsets that TracFone purchased.[226]

245. Prof. Blair makes a similar mistake when he estimates the conspirator share of panels for handsets that TracFone purchased. To estimate these shares, Prof. Blair uses panel purchase data from Motorola and Nokia. However, Prof. Blair does not consider that the proportion of STN and TFT panels that Motorola and Nokia purchased (and the conspirators who supplied panels for each of those technology types) is not necessarily representative of the proportion of STN and TFT panels in handsets that TracFone purchased.[227,228] We have

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[225] Prof. Blair uses TracFone's transaction-level purchase data to estimate the number of handsets that TracFone purchased in 2002. TracFone's transaction-level purchase data have duplicate entries though. Because appropriate data are not available to estimate the number of handsets that TracFone purchased in 2002, we accept Prof. Blair's estimate provisionally. We may update our calculations should TracFone produce different data in the future.

[226] See Appendix E.9 for a description of how we linked panel resolutions in the DisplaySearch data to the handsets that TracFone purchased.

[227] Deposition of Roger Blair, October 17-18, 2013, p. 166:1-23.

> Q. All right. So when you calculated average panel prices, you included all panel sizes and resolution from mobile phone panels, right? A. Yes, as reported in the DisplaySearch data, yes. Q. Okay. So let me ask you: Based on your knowledge of TracFone's business model and their business practices, isn't it true that the handset models that TracFone sold contained LCD panels with low resolution compared to the average handset panel being sold in the LCD -- in the mobile phone marketed; isn't that a fair statement? A. Well, I don't know - - I didn't make that comparison, so I don't know, but, you know, obviously to the extent that you're comparing the resolution in MSTN, CSTN or TFT to one another, you know, to the extent that their resolutions are different, if the panels…that TracFone is buying indirectly are of a lower resolution, then they are of a lower resolution. I didn't check that specifically, but that's easy to do, I guess.

corrected Prof. Blair's conspirator share estimates by estimating conspirator shares using DisplaySearch data and weighting by the proportion of STN and TFT handsets that TracFone actually purchased.

246. Finally, Prof. Blair estimates TracFone's direct damages based on its purchases of LG Electronics handsets. In total, he estimates that TracFone purchased 266,174 handsets from LG Electronics, which he says represent $257,433 in direct damages.[229] To estimate these damages, Prof. Blair assumes that 100 percent of the panels in these LG Electronics handsets were supplied by LG Display.[230] But during the alleged conspiracy period, TracFone purchased only one handset model from LG Electronics – the LG 3280/VX3300 series.[231] According to LG Electronics' panel purchase data and LG Electronics' Senior Manager of MC Display Purchase Team, this handset model contained a panel that was supplied exclusively by Nan Ya Corporation in Taiwan,[232] a non-conspirator.[233] It is our understanding that purchases of this handset are not subject to damages because they did not include panels that were manufactured by a conspirator.[234]

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228 Specifically, 84 percent of TracFone's handset purchases contain STN panels (according to TracFone's purchases data), whereas 64 percent of the combined Motorola and Nokia panel purchases are STN panels.

229 Blair Declaration, June 6, 2013, ¶154.

230 Deposition of Roger Blair, October 17-18, 2013, p. 256:15-16.

> A. I assumed that LG-manufactured LCD panels went into the LG phones . . .

231 Declaration of Wonseok Lee Regarding Tracfone Handset Purchases from LG Electronics, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 10-cv-03205-SI, No. 3:07-MD-1827, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, October 30, 2013 (hereafter, "Wonseok Lee Declaration"), ¶¶ 3-4; "2003 to 2008 Phones Purchases-Units Only-LCD Case.xlsx"; "LG VX-3300 Specifications," *PhoneArena.com*, www.phonearena.com/phones/LG-VX-3300_id951, visited on October 16, 2013.

232 Wonseok Lee Declaration, ¶¶ 1, 6-8; "Cell Phones--Module Purchases U.S- Bound 2005-2008.xls."

233 Deposition of Roger Blair, October 17-18, 2013, p. 257:1-9.

> Q. Is the Nanya Corporation an alleged member of the conspiracy? A. I don't know. We would have to look at that list, but that doesn't sound familiar. Q. All right. So if Nanya is not shaded on Exhibit 5 as -- identified as a cartel member, then you would agree that it is not considered a conspirator, correct? A. Yes, that's correct."

234 Deposition of Roger Blair, October 17-18, 2013, p. 257: 10-20.

VII. DAMAGES ANALYSIS

A. Overview

247. In this section we describe each plaintiff's business model, report our estimates of pass-through to and by each plaintiff (where relevant), describe our calculation of each plaintiff's direct and indirect volume of commerce, and report our estimate of each plaintiff's damages.[235,236]

248. We have been asked to estimate each plaintiff's volume of commerce and damages during the period from August 1998 to December 2006 (the "Conspiracy Period") and from September 2001 to December 2006 (the "Plea Period").

249. We report our estimates of pass-through in Exhibits VII.1 – VII.12.[237]

250. We explain in Section V.B.vii that pass-through can be estimated controlling for quality differences among products and for product life cycle effects: (i) in levels; (ii) by demeaning the data; and (iii) by differencing the data. We report in Appendix M estimates of equation 3 using demeaned data and estimates of Dean Snyder's first-differences model from previous phases of this litigation. The average pass-through estimates are similar. We also report in Appendix M associated damages estimates; these damages estimates are also similar. For example, the average difference in damages across all plaintiffs is $40,927. The similarity of the results also derives from the fact that damage totals are based on Prof. Carlton's estimated overcharges and they reflect both upstream and downstream pass-

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> Q. So if your backup data showed that during the cartel period, TracFone only purchased one model of handset from LG Electronics and LG Electronics' purchase data that was produced as part of this litigation showed that LG Electronics purchased all the panels incorporated in that model from Nanya Corporation, a non-conspirator, would you then agree that you should have excluded purchases of LG handsets from your damages calculation? A. Yes.

235 As a matter of economics, pass-through is relevant to direct and indirect purchases. We understand that as a legal matter pass-through may be relevant in some but not all circumstances.

236 Appendix D provides an overview of the methods that we use to estimate volume of commerce and damages.

237 To estimate damages, pass-through estimates that are greater than 100 percent are capped at 100 percent.

through behavior, accounting for quality differences among products and product life cycle effects.

251. We have been instructed by counsel to estimate damages using Prof. Carlton's panel overcharge estimates. We report these estimates in Exhibit III.1. We have also been instructed by counsel to estimate damages using Prof. Bernheim's estimates of panel overcharges and estimates of pass-through based on Prof. Bernheim's pass-through specifications. We report these alternative estimates in Appendix E.

252. We understand that the defendants may make arguments that may affect the transactions that are to be included in damages estimates. While it is not possible to predict every possible scenario, we have included appendices that could be used to estimate damages based on many possible scenarios. Our appendices, for example, could be used to estimate damages if the Court or a jury were to determine that some but not all alleged conspirators participated in the alleged conspiracy.

B. Panel Distributor Plaintiffs

i. All-American Semiconductor

253. All-American Semiconductor ("AASI") was an LCD panel distributor that filed for Chapter 11 bankruptcy protection in 2007. AASI is claiming damages on LCD panels that it purchased directly from alleged conspirators and alleged affiliates.[238] During the period of the alleged conspiracy, AASI's purchases accounted for 0.10 percent of all large LCD panels and 0.01 percent of all small LCD panels sold worldwide.[239]

254. AASI purchased LCD panels from LCD panel manufacturers and resold the panels to LCD product manufacturers. Figure VII.1 shows AASI's position in the relevant supply chain.

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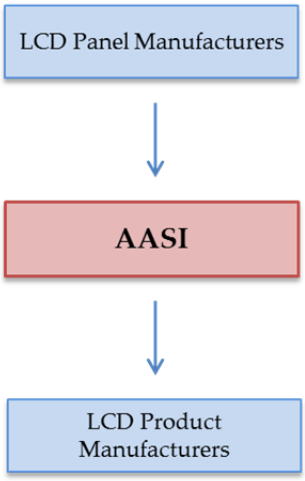
[238] Bernheim AASI Report, June 13, 2013, ¶¶11, 12, and 14.

[239] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.1: AASI's Position in the Supply Chain



255. We have been instructed by counsel to calculate the dollar value of AASI's purchases of alleged conspirator LCD panels.[240] We have also been instructed to use this as our estimate of AASI's volume of commerce. We estimate that AASI's volume of commerce is $303,463,231 during the Conspiracy Period and $243,152,298 during the Plea Period.

256. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. To estimate damages, we multiply Prof. Carlton's panel overcharge estimate and our estimate of AASI's volume of commerce:

Damages = panel overcharge estimate x volume of commerce

257. We estimate that AASI's damages are $2,068,017 during the Conspiracy Period and $1,713,586 during the Plea Period, not accounting for pass-through by AASI. We understand from counsel that the Court may decide that if some or all of AASI's sales were made on a cost-plus basis, then damages from AASI's sales of these products would be subject to downstream pass-through. If so, damages to AASI on these products would be zero because pass-through is at least 100 percent under cost-plus pricing.

258. We also understand that due to AASI's bankruptcy proceedings, AASI may not have paid for all panels that it purchased. Counsel has asked us to separately set forth damages

[240] Appendix E.1 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the AASI matter. Appendix E.1 also describes how we estimate AASI's volume of commerce and damages.

associated with those unpaid transactions. We report those damages in Appendix E.1. We also understand that AASI has brought a "preference action" related to payments made to Samsung that is pending.[241] We reserve the right to update these calculations in the event this preference action is resolved.

ii. Jaco

259. Jaco is a distributor of electronics and displays. Jaco is claiming damages on the LCD panels that it purchased from alleged conspirators and alleged affiliates.[242] During the period of the alleged conspiracy, Jaco's purchases accounted for 0.04 percent of all large LCD panels and 0.003 percent of all small LCD panels sold worldwide.[243]

260. Jaco purchased LCD panels from LCD panel manufacturers and resold them to LCD product manufacturers. Jaco also designed and manufactured customized LCD displays for customers in a variety of industries, including aerospace, electronic voting, and medical devices. Figure VII.2 shows Jaco's position in the relevant supply chain.

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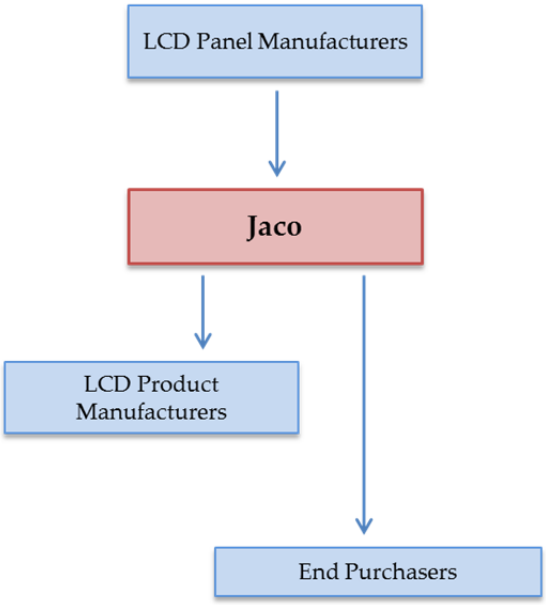
[241] A preference action is brought by a debtor to recover payments made to a creditor prior to the filing of bankruptcy.

[242] Bernheim Jaco Report, June 13, 2013, ¶¶11, 12, and 14.

[243] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.2: Jaco's Position in the Supply Chain



261. We have been instructed by counsel to calculate the dollar value of Jaco's purchases of alleged conspirator LCD panels.[244] We have also been instructed to use this as our estimate of Jaco's volume of commerce. We estimate that Jaco's volume of commerce is $169,437,388 during the Conspiracy Period and $104,727,034 during the Plea Period.

262. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. To estimate damages, we multiply Prof. Carlton's panel overcharge estimate and our estimate of Jaco's volume of commerce.

Damages = panel overcharge estimate x volume of commerce

263. We estimate that Jaco's damages are $1,057,422 during the Conspiracy Period and $557,071 during the Plea Period.

[244] Appendix E.2 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the Jaco matter. Appendix E.2 also describes how we estimate Jaco's volume of commerce and damages.

C. LCD Product Manufacturer Plaintiff

iii. Syntax Brillian

264. Syntax Brillian ("Syntax") was a branded manufacturer of LCD televisions that filed for Chapter 11 protection in 2008.[245] Syntax has provided what it calls "two alternative measures of damages."[246] Dr. Snow's measure of damages is based on Syntax's purchases of LCD televisions. During the relevant period, Syntax's purchases of LCD televisions accounted for 0.04 percent of all large LCD panels.[247] Syntax did not purchase small LCD panels or LCD products that contained small LCD panels.

265. Syntax purchased LCD televisions from product assembler Taiwan Kolin and resold those televisions to retailers in the United States under the Olevia brand name.[248,249] Figure VII.3 shows Syntax's position in the relevant supply chain.

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245 The company's assets were purchased by Emerson Radio Corp. in 2009.

246 Snow Expert Report, June 13, 2013, ¶¶10, 11.

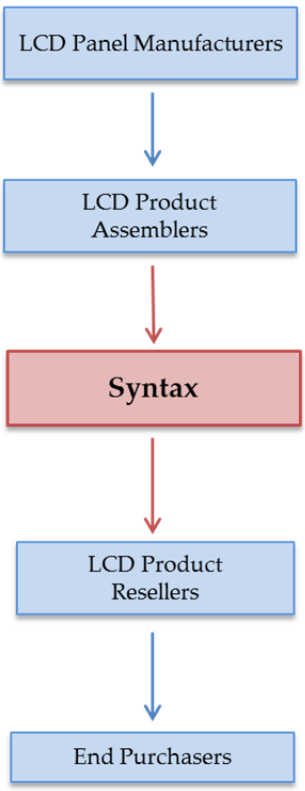
247 These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

248 To estimate damages to Syntax, we have been instructed to consider all of Syntax's purchases of LCD products to be indirect purchases. We understand that all of Syntax's purchases of LCD products were from third-party LCD product assembler Taiwan Kolin and that Taiwan Kolin is not an alleged conspirator or an alleged affiliate.

249 Snow Deposition, October 10, 2013, p. 170:13-18.

> Q. When you looked at Syntax, the records of Syntax -- okay? -- it was clear to you that the transactions, based on your review, what you were looking at, were the purchases of televisions from Kolin. Fair? A. That's -- that's my understanding, yes.

Figure VII.3: Syntax's Position in the Supply Chain



266. To estimate the percentage of any panel overcharge that Syntax would have paid on its purchases of LCD televisions, an estimate of pass-through by Taiwan Kolin is required. Syntax has not produced data that we can use to estimate pass-through by Taiwan Kolin. Because appropriate data are not available to estimate pass-through to Syntax at this time, we will provisionally use a pass-through rate of 100 percent for the purpose of estimating Syntax's damages.[250]

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[250] Dr. Snow testified that he was not able to quantify or measure the impact of price reductions on the prices that Kolin charged Syntax. Snow Deposition, October 10, 2013, pp. 192:3-7, and 197:1-7.

> Q. So, independently, you haven't attempted to quantify or measure the impact of price reductions on the prices charged by Kolin to Syntax. Fair statement? A. I have attempted to do so, but have not.
>
> Q. Don't you have to understand how the costs increase or decrease in order to get a sense of what the pass-through rate is? A. You -- Well, again, there are lots of conditions under which it could exist. Given the data I've got, I can't tell one way or another.

267. To estimate the percentage of any overcharge that Syntax would have passed on to its customers, an estimate of pass-through by Syntax is required. Syntax did not produce matched price-cost data and so we use matched price-cost data for other LCD product manufacturers.[251,252]

268. We report our estimates of pass-through in Table VII.1. Our preferred specification when estimating pass-through using matched price-cost data is equation 3. (See discussion in Section V.) We estimate that pass-through by LCD product manufacturers is 105 percent for televisions.

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[251] The cost data that Syntax produced are not reliable. We understand from deposition testimony that Syntax has alleged that Taiwan Kolin charged Syntax prices with the expectation that these would later be offset by credits. (Deposition of Michael Miller, Syntax 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 10-cv-5458-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, December 3, 2012, pp. 116-120.) We understand that the data that Syntax produced do not include these credits. (Plaintiff SB Liquidation Trust's Amended Responses to Defendants' Fifth Set of Interrogatories, *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, This Document Relates to Case No. 10-CV-5458 SI, Master File No. 3:07-md-1827 SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, June 18, 2013.)

[252] Snow Deposition, October 10, 2013, p. 207:15-21.

> A. I want to be careful, because I -- by -- it applies both to, you know, Syntax as the purchaser and Syntax as, you know, selling downstream and that the perfectly competitive environment may lead to a hundred percent pass-through. So, would it surprise me if analysis showed it were a hundred percent? No.

Table VII.1
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to Syntax Brillian

Application	LCD Product Assembler Pass-Through [To]	LCD Product Manufacturer Pass-Through [By]
Televisions	100%	105%

Notes and Sources:

[1] Pass-through by LCD product assemblers is assumed to be 100%. Pass-through by Syntax Brillian is estimated using sales data provided by other LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

269. We have been instructed by counsel to calculate the dollar value of Syntax's indirect purchases of alleged conspirator LCD panels.[253] We have also been instructed to use this as our estimate of Syntax's indirect volume of commerce. We estimate that Syntax's indirect volume of commerce is $162,055,325 during the Conspiracy Period and $161,217,770 during the Plea Period.

270. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. We multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to Syntax, one minus our estimate of pass-through by Syntax, and Syntax's indirect volume of commerce.

Indirect damages = estimated panel overcharge x indirect volume of commerce x pass-through to Syntax x (1 – pass-through by Syntax)

271. We estimate that Syntax's indirect damages are $0 during the Conspiracy Period and $0 during the Plea Period.

[253] Appendix E.3 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the Syntax matter. Appendix E.3 also describes how we estimate Syntax's volume of commerce and damages.

D. Technology Services Plaintiff

iv. CompuCom

272. CompuCom manages the purchase, delivery, installation and support of a variety of computer and display products for business customers.[254] CompuCom is claiming damages on LCD products that it purchased from alleged conspirators and alleged affiliates as well as from third-party LCD product manufacturers and distributors.[255] During the period of the alleged conspiracy, CompuCom's purchases of LCD products accounted for 0.16 percent of all large LCD panels and 0.001 percent of all small LCD panels sold worldwide.[256]

273. CompuCom purchased digital cameras, monitors, notebooks, and televisions from LCD product manufacturers, and digital camcorders, digital cameras, mobile phones, monitors, notebooks and televisions from LCD product distributors, including the plaintiff Tech Data. CompuCom resold these products to business customers. Figure VII.4 shows CompuCom's position in the relevant supply chain.

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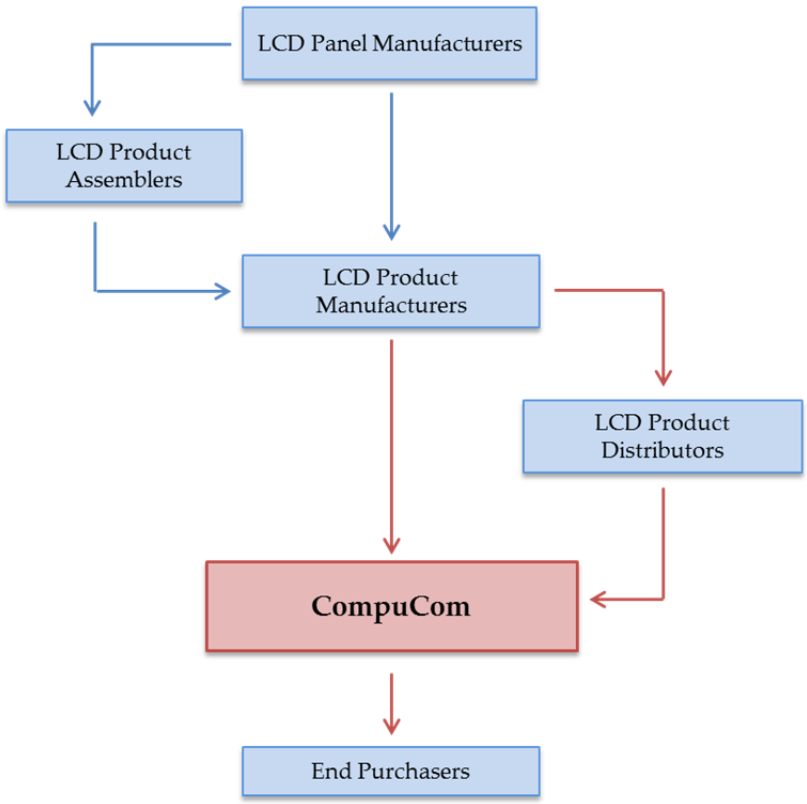
254 Marx CompuCom Report, June 13, 2013, ¶25.

255 Marx CompuCom Report, June 13, 2013, ¶13.

256 These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.4: CompuCom's Position in the Supply Chain



274. To estimate the percentage of any panel overcharge that CompuCom would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that CompuCom would have passed on to its customers, an estimate of pass-through by CompuCom is required.

275. We report our estimates of pass-through by LCD product manufacturers, LCD product distributors, and CompuCom in Table VII.2 below. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 117 percent. Our estimates of pass-through by CompuCom range from 67 percent to 116 percent.

Table VII.2
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to CompuCom

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	CompuCom Pass-Through [By]
Digital Camcorders	65%	95%	72%
Digital Cameras	50%	99%	93%
Mobile Phones	104%	117%	81%
Monitors	99%	112%	93%
Notebooks	78%	109%	67%
Televisions	105%	106%	116%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by CompuCom is estimated using sales data provided by CompuCom (see Exhibit VII.2). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by Distributors on sales of notebooks is assumed to be equal to the average pass-through rate by DBL Distributing on sales of all applications.

[3] Data on sales of digital camcorders by CompuCom were not available to measure pass-through. Pass-through by CompuCom on sales of digital camcorders is assumed to be equal to the average pass-through rate by CompuCom on sales of all applications.

276. We have been instructed by counsel to calculate the dollar value of CompuCom's direct purchases of alleged conspirator LCD panels.[257] We have also been instructed to use this as our estimate of CompuCom's direct volume of commerce. We estimate that CompuCom's direct volume of commerce is $144,137,834 during the Conspiracy Period and $53,853,072 during the Plea Period.

[257] Appendix E.4 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the CompuCom matter. Appendix E.4 also describes how we estimate CompuCom's volume of commerce and damages.

277. We have been instructed by counsel to calculate the dollar value of CompuCom's indirect purchases of alleged conspirator LCD panels. We have also been instructed to use this as our estimate of CompuCom's indirect volume of commerce. We estimate that CompuCom's indirect volume of commerce is $207,692,168 during the Conspiracy Period and $149,832,773 during the Plea Period.

278. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of CompuCom's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

279. We estimate that CompuCom's direct damages are $576,936 during the Conspiracy Period and $215,798 during the Plea Period. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to CompuCom,[258] one minus our estimate of pass-through by CompuCom, and CompuCom's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to CompuCom x (1 – pass-through by CompuCom)

280. We estimate that CompuCom's indirect damages are $131,103 during the Conspiracy Period and $81,008 during the Plea Period.

E. Buyer Cooperative Plaintiffs

v. MARTA

281. MARTA is a not-for-profit buyer cooperative that negotiated acquisition prices and made purchases on behalf of its members. MARTA is claiming damages on behalf of its members for purchases of LCD products from alleged conspirators and alleged affiliates as well as

[258] For LCD product purchases from LCD product manufacturers, our estimate of pass-through to CompuCom is the estimate of pass-through by LCD product manufacturers. For LCD product purchases from LCD product distributors, our estimate of pass-through to CompuCom is the estimate of pass-through by LCD product manufacturers times the estimate of pass-through by LCD product distributors.

purchases from third party LCD product manufacturers and distributors.[259,260] During the period of the alleged conspiracy, MARTA's purchases of LCD products accounted for 0.007 percent of all large LCD panels and 0.001 percent of all small LCD panels sold worldwide.[261]

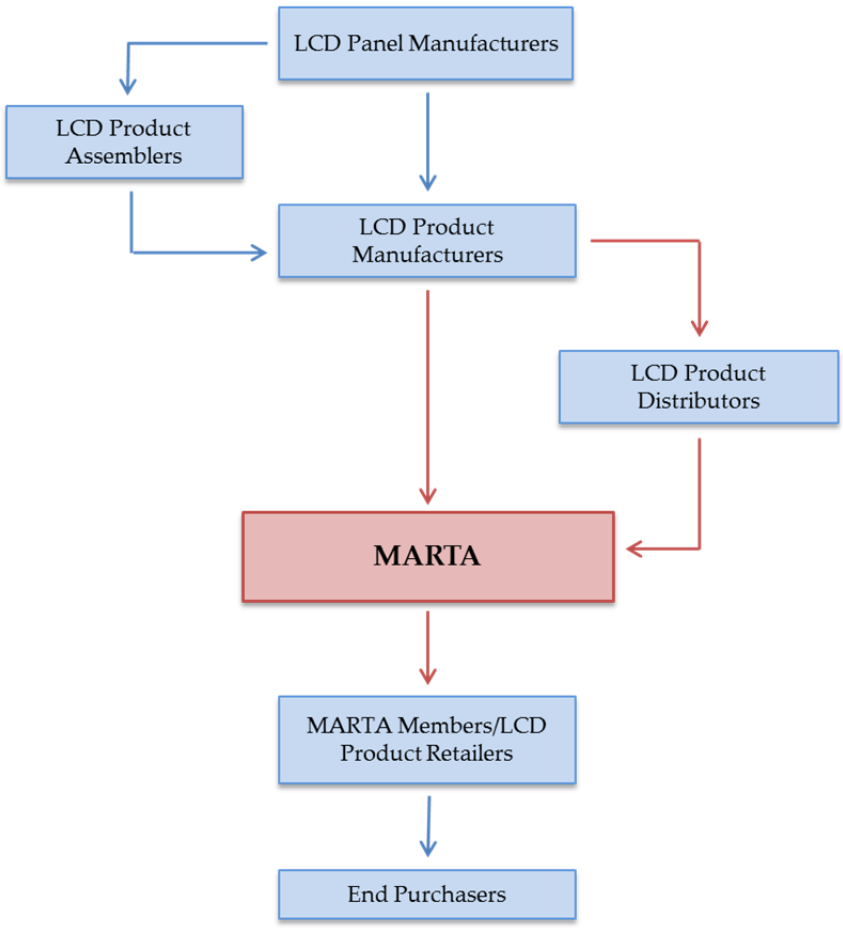
282. MARTA purchased digital camcorders, digital cameras, monitors, portable DVD players and televisions from LCD product manufacturers, and televisions from LCD product distributors. Figure VII.5 shows MARTA's position in the relevant supply chain.

[259] Marx P.C. Richard et al. Report, June 13, 2013, ¶13.

[260] We understand that defendants intend to move for summary judgment on MARTA's Sherman Act claims on the grounds that MARTA's members – not MARTA – are the true direct purchasers. The outcome of this summary judgment would affect which of MARTA's purchases are correctly classified as "indirect" for the purposes of calculating damages. For the purposes of this report, we accept MARTA's claims as alleged to estimate MARTA's direct and indirect volume of commerce and make no independent assessment of the validity of MARTA's claims.

[261] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.5: MARTA's Position in the Supply Chain



283. To estimate the percentage of any panel overcharge that MARTA would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that MARTA would have passed on to its customers, an estimate of pass-through by MARTA is required.

284. We report our estimates of pass-through in Table VII.3. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimates of pass-through by LCD product manufacturers range from 65 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 106 percent. Our estimates of pass-through by MARTA range from 96 percent to 102 percent.

Table VII.3
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to MARTA

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	MARTA Pass-Through [By]
Digital Camcorders	65%	95%	96%
Portable DVD Players	89%	106%	102%
Televisions	105%	106%	100%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by MARTA is estimated using sales data provided by MARTA (see Exhibit VII.3). A more detailed description of the data used to estimate pass-through is provided in Appendix

[2] Data on sales of portable DVD players by LCD product manufacturers were not available to measure pass-through. Pass-through by LCD product manufacturers on sales of portable DVD players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales of all applications.

285. We have been instructed by counsel to calculate the dollar value of MARTA's direct purchases of alleged conspirator LCD panels.[262] We have also been instructed to use this as our estimate of MARTA's direct volume of commerce. We estimate that MARTA's direct volume of commerce is $28,240,986 during the Conspiracy Period and $28,170,192 during the Plea Period.

286. We have been instructed by counsel to calculate the dollar value of MARTA's indirect purchases of alleged conspirator LCD panels. We have also been instructed to use this as our estimate of MARTA's indirect volume of commerce. We estimate that MARTA's

[262] Appendix E.5 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the MARTA matter. Appendix E.5 also describes how we estimate MARTA's volume of commerce and damages.

indirect volume of commerce is $1,695,681 during the Conspiracy Period and $1,677,425 during the Plea Period.

287. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of MARTA's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

288. We estimate that MARTA's direct damages are $116,528 during the Conspiracy Period and $115,869 during the Plea Period, not accounting for pass-through by MARTA.[263] We understand from counsel that the Court may decide that if some of MARTA's sales were made on a cost-plus basis, then damages from MARTA's purchases of these products would be subject to downstream pass-through. If so, damages to MARTA on these purchases would be zero because pass-through is at least 100 percent under cost-plus pricing.

289. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to MARTA, one minus our estimate of pass-through by MARTA, and MARTA's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to MARTA x (1 – pass-through by MARTA)

290. We estimate that MARTA's indirect damages are $6 during the Conspiracy Period and $6 during the Plea Period.

vi. NECO Alliance

291. NECO Alliance is a not-for-profit, consortium of buying cooperatives ("chapters") that negotiated acquisition prices on behalf of the chapters. NECO has been assigned the claims associated with certain chapters' purchases from alleged conspirators and alleged

[263] We understand that the validity of MARTA's direct claims will be the subject of a summary judgment motion. Depending on the outcome of that motion, our estimates of MARTA's direct damages may be reduced or adjusted to $0. We reserve the right to supplement our calculation of MARTA's direct and indirect damages as necessary to appropriately reflect the summary judgment ruling.

affiliates.[264] During the period of the alleged conspiracy, NECO's assignors' "purchases" of LCD products accounted for 0.004 percent of all large LCD panels and 0.00008 percent of all small LCD panels sold worldwide.[265]

292. As a cooperative of cooperatives, NECO negotiated prices with manufacturers on behalf of the chapters; it did not buy or sell LCD products or take possession of them.[266] The chapters, in turn, charged their member retailers their acquisition cost of the LCD product plus a fixed fee.[267] Figure VII.6 shows NECO's position in the relevant supply chain.

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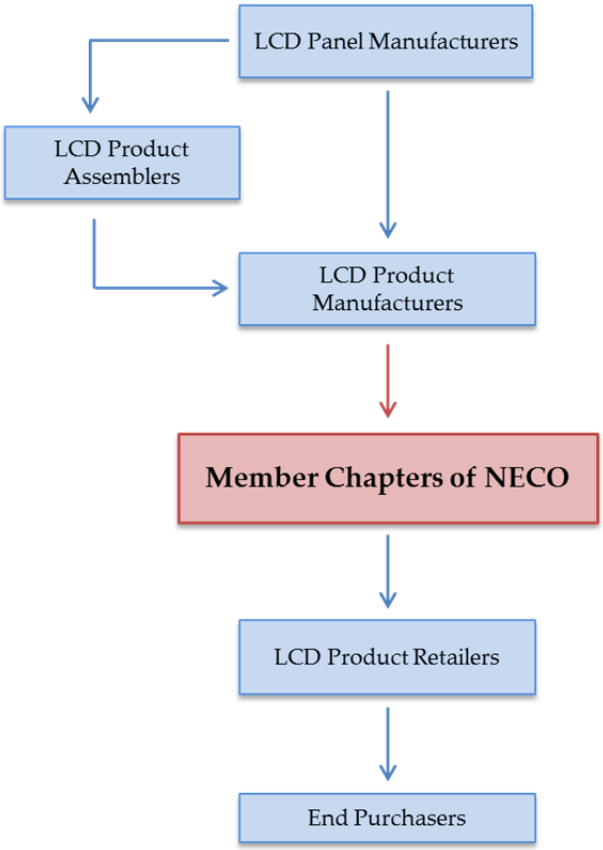
[264] In this report when we reference "NECO" in terms of its purchases, pass-through, or damages, we are referencing the NECO as holder of the assigned claims from certain chapters.

[265] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

[266] NECO negotiated prices for members' purchases of digital camcorders, digital cameras, portable DVD players, and televisions from LCD product manufacturers.

[267] Deposition of Albert Leslie Souza, NECO Alliance, *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, No. 12-1426 SI, Master File No. M:07-1827-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, April 26, 2013, p. 34:3-14.

Figure VII.6: NECO's Position in the Supply Chain



293. With regard to the percentage of any overcharge that the assigning chapters would have passed on to their members, we have reviewed deposition testimony and other materials that indicate that the chapters charged their member retailers what they paid for the products plus a small predetermined administrative fee for each transaction.[268] As a matter of economics, pass-through is at least 100 percent if the chapters charged their member

[268] NECO's chapters each set their own administrative fees. These fees ranged from 2 percent to 3.75 percent of the product cost. See Deposition of Henry van Beuzekom, NECO Alliance, *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, No. 12-1426 SI, Master File No. M:07-1827-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, April 23, 2013, pp. 96-97; Deposition of Gerald A. Grasso, NECO Alliance, *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, No. 12-1426 SI, Master File No. M:07-1827-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, April 24, 2013, pp. 17-18; Deposition of Vito Blandi, NECO Alliance, *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, No. 12-1426 SI, Master File No. M:07-1827-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, April 25, 2013, pp. 41-42; Deposition of Albert Leslie Souza, NECO Alliance, *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, No. 12-1426 SI, Master File No. M:07-1827-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, April 26, 2013, p. 34.

retailers what they paid for products plus an administrative fee. For example, if the assigning chapters charged their members their acquisition cost plus an administrative fee of 5 percent, the pass-through of any change in acquisition cost will be 105 percent; that is, when the acquisition cost of a product increases from $100 to $105, the price that the assigning chapter charges its members increases from $105 (=$100 + 5%*$100) to $110.25 (=$105 + 5%*$105). This means that a $5 increase in acquisition cost translates to a $5.25 increase in price, which is a pass-through rate of 105 percent. NECO has not produced data that we can use to estimate pass-through by the assigning chapters. Until appropriate data are made available, we would use a pass-through rate of 100 percent for pass-through by the assigning chapters to calculate NECO's damages if the Court determines that pass-through can be applied when calculating NECO's damages.

294. We have been instructed by counsel to calculate the dollar value of NECO's direct purchases of alleged conspirator LCD panels during the Conspiracy Period.[269] We have also been instructed to use this as our estimate of NECO's direct volume of commerce. We estimate that NECO's direct volume of commerce is $18,083,753 during the Conspiracy Period and $18,046,436 during the Plea Period.

295. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. We multiply Prof. Carlton's panel overcharge estimate and NECO's volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

296. We estimate that NECO's damages are $73,287 during the Conspiracy Period and $73,138 during the Plea Period, not accounting for pass-through by NECO's assignors. We understand from counsel that the Court may decide that if NECO's assignors' sales were made on a cost-plus basis, then damages from NECO's assignors' purchases are subject to

[269] Appendix E.6 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the NECO matter. Appendix E.6 also describes how we estimate NECO's volume of commerce and damages.

downstream pass-through. If so, damages to NECO would be zero because pass-through is at least 100 percent under cost-plus pricing.

F. LCD Product Distributor Plaintiffs

vii. Tech Data

297. Tech Data is a distributor of electronics products.[270] Tech Data is claiming damages on direct purchases of LCD products from alleged conspirators and alleged affiliates and third party LCD product manufacturers.[271] During the period of the alleged conspiracy, Tech Data's purchases of LCD products accounted for 0.87 percent of all large LCD panels and 0.10 percent of all small LCD panels sold worldwide.[272]

298. Tech Data purchased digital camcorders, digital cameras, mobile phones, monitors, media players, notebooks, portable DVD players and televisions from LCD product manufacturers, and resold them to LCD product retailers.[273] Figure VII.7 shows Tech Data's position in the relevant supply chain.

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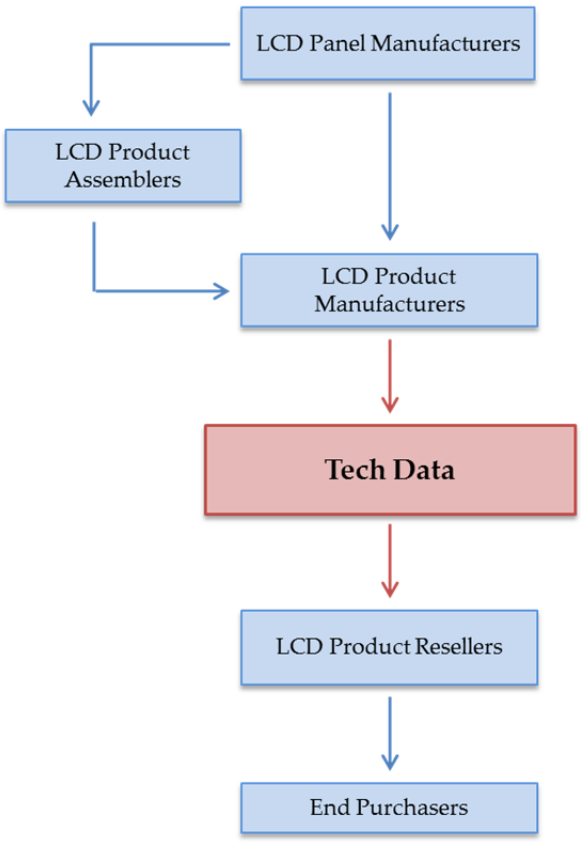
[270] Marx Tech Data Report, June 13, 2013, ¶25.

[271] Marx Tech Data Report, June 13, 2013, ¶13.

[272] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

[273] Tech Data also purchased from LCD product distributors. It is not claiming damages on these purchases. See Backup Production to Marx Tech Data Report, June 13, 2013.

Figure VII.7: Tech Data's Position in the Supply Chain



299. To estimate the percentage of any panel overcharge that Tech Data would have paid, estimates of pass-through by LCD product manufacturers are required. To estimate the percentage of any overcharge that Tech Data would have passed on to its customers, estimates of pass-through by Tech Data are required.

300. With regard to pass-through by Tech Data, the sales data that Tech Data produced do not include acquisition costs. This means that it would be necessary to map costs in Tech Data's purchases data to prices in Tech Data's sales data. This would result in measurement error. The mapping of costs from one data source to prices in another data source would be imprecise. DBL Distributing, a distributor of electronics products, has produced sales data that also include acquisition costs. In our opinion, the DBL data are more reliable than the

data provided by Tech Data, and so we use the DBL data to estimate pass-through by Tech Data.[274,275]

301. We report our estimates of pass-through in Table VII.4. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by Tech Data range from 95 percent to 117 percent.

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274 Any differences between DBL and Tech Data's average pass-through rates are likely to be small. Average pass-through is largely a market-wide phenomenon; it depends on competition and demand. There is no reason to expect that competition and demand are significantly different for DBL and Tech Data. They are both LCD product distributors. Furthermore, any potential differences between DBL and Tech Data's pass-through rates needs to be compared to the potential error associated with using price and cost data from different sources. There is no reason to expect that DBL's pass-through rate would be systematically higher or lower than Tech Data's pass-through rate. An estimate of pass-through based on price and cost data that are from different sources can be expected to be biased downward.

275 Previously in Track 1, Dean Snyder estimated pass-through by Electrograph, a distributor of electronics products, using price and cost data from different Electrograph databases (i.e., a sales database and a purchases database). At the time, he recognized the limitations of these data, but had not identified an alternative. Since Dean Snyder prepared his Track 1 report, we have had the opportunity to evaluate sales data produced by DBL Distributing that also includes DBL's acquisition costs. Here, we need to estimate pass-through by Tech Data, also a distributor of electronics products. Like Electrograph, Tech Data's price and cost data are from different databases. In our opinion, for the purpose of estimating pass-through by Tech Data, the DBL data are more reliable than the data produced by Tech Data. Accordingly, we use the DBL data to estimate pass-through by Tech Data.

Table VII.4
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to Tech Data

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [By]
Digital Camcorders	65%	95%
Digital Cameras	50%	99%
Mobile Phones	104%	117%
Monitors	99%	112%
MP3/Media Players	89%	101%
Notebooks	78%	109%
Portable DVD Players	89%	106%
Televisions	105%	106%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by Tech Data is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of portable DVD players and MP3/media players by LCD product manufacturers were not available to measure pass-through. Pass-through by LCD product manufacturers on sales of portable DVD players and MP3/media players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales of

[3] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by distributors on sales of notebooks is assumed to be equal to the average pass-through rate by DBL Distributing on sales of all applications.

302. We have been instructed by counsel to calculate the dollar value of Tech Data's direct purchases of alleged conspirator LCD panels, during the Conspiracy Period. We have also been instructed to use this as our estimate of Tech Data's direct volume of commerce. We

estimate that Tech Data's direct volume of commerce is $791,125,773 during the Conspiracy Period and $513,770,426 during the Plea Period.[276]

303. We have been instructed by counsel to calculate the dollar value of Tech Data's indirect purchases of alleged conspirator LCD panels, during the Conspiracy Period.[277] We have also been instructed to use this as our estimate of Tech Data's indirect volume of commerce. We estimate that Tech Data's indirect volume of commerce is $1,097,900,313 during the Conspiracy Period and $818,022,297 during the Plea Period.

304. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of Tech Data's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

305. We estimate that Tech Data's direct damages are $3,193,282 during the Conspiracy Period and $2,069,862 during the Plea Period.

306. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to Tech Data, one minus our estimate of pass-through by Tech Data, and Tech Data's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to Tech Data x (1 – pass-through by Tech Data)

307. We estimate that Tech Data's indirect damages are $2,286 during the Conspiracy Period and $1,935 during the Plea Period.

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[276] Tech Data's counsel instructed Prof. Marx not to include Tech Data's purchases from non-manufacturers such as distributors and wireless carriers in her damages estimates. See Marx Deposition, October 9, 2013, pp. 239:21-240:2. "Q. …Why did you not calculate damages arising from these distributors when they were in the data? A. I was given from counsel the list of suppliers to consider, and I took that as an instruction from counsel." We have been instructed by counsel for the defendants to do so as well.

[277] Appendix E.7 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the Tech Data matter. Appendix E.7 also describes how we estimate Tech Data's volume of commerce and damages.

G. Wireless Carrier Plaintiffs

viii. MetroPCS

308. MetroPCS is a wireless carrier that sells both mobile phones and wireless services to retailers and end purchasers.[278] MetroPCS is claiming damages on purchases of handsets from alleged conspirators and alleged affiliates and third party handset manufacturers.[279] During the period of the alleged conspiracy, MetroPCS's purchases of mobile phones accounted for 0.10 percent of all small LCD panels.[280] MetroPCS did not purchase large-panel products.

309. MetroPCS purchased handsets from LCD product manufacturers and sold them to both retailers and end purchasers.[281] Figure VII.8 shows MetroPCS's position in the relevant supply chain.

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278 Marx MetroPCS Report, June 13, 2013, ¶24.

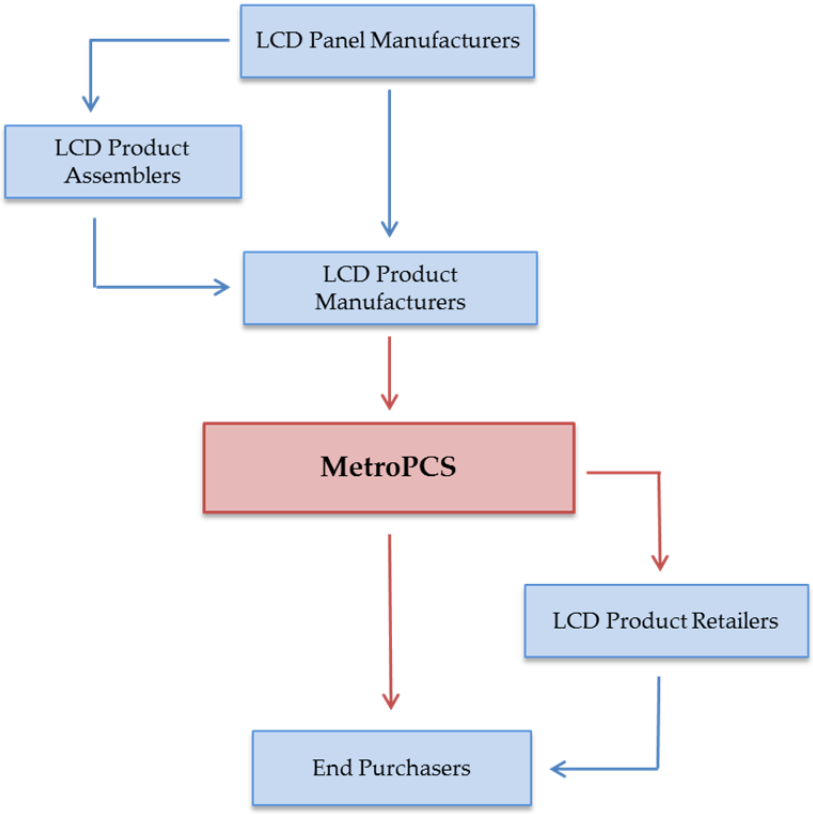
279 Marx MetroPCS Report, June 13, 2013, ¶13.

280 These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

281 Deposition of Douglas S. Glen, MetroPCS 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:11-cv-00829-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, October 26, 2012 (hereafter "Douglas Glen MetroPCS Deposition, October 26, 2012"), pp. 98:24-99:1-2 and 6-8.

> Q. What percentage of MetroPCS's handsets were sold to dealers? A. In this time frame, I would estimate around 90 percent. […] Q. Did MetroPCS sell directly to end-use consumers? A. Yes.

Figure VII.8: MetroPCS's Position in the Supply Chain



310. MetroPCS typically sold handsets to retailers for $20 less than its acquisition cost, with a suggested retail price that was $20 above its acquisition cost (implying a $40 margin for the retailer).[282] In other words, MetroPCS sold LCD handsets to retailers at its acquisition cost less $20. MetroPCS then recouped this negative mark-up as customers bought wireless services over the life of the handset.[283] When MetroPCS sold directly to consumers through its own retail locations, it sold handsets at the suggested retail price of $20 above its

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[282] Douglas Glen MetroPCS Deposition, October 26, 2012, p. 76:1-20.

> Q. What was the typical approach to the price that MetroPCS sold the handset compared to the price at which it purchased the handset? […] A. …MetroPCS would sell the handset to the dealer typically at $20 below the cost that MetroPCS paid. Q. With a suggested retail price of $20 more than MetroPCS paid? A. Correct, which would lead the dealer to have approximately a $40 margin for handling and selling the phone.

[283] Douglas Glen MetroPCS Deposition, October 26, 2012, p. 102:21-24.

> Q. How many months of service is required to cover that cost? A. A rough estimate would be between six and seven months, in that time period.

acquisition cost.[284] In other words, MetroPCS sold LCD handsets directly to consumers at its acquisition cost plus $20.

311. With regard to the percentage of any overcharge that MetroPCS would have passed through to its customers, pass-through is 100 percent if MetroPCS charged retailer customers what it paid for handsets less $20. Similarly, pass-through is 100 percent if MetroPCS charged final consumers what it paid for handsets plus $20 at its retail stores. A mechanical relationship between price and cost, in which price is equal to cost plus or minus some amount, necessarily implies pass-through of 100 percent.[285]

312. To estimate the percentage of any panel overcharge that MetroPCS would have paid, an estimate of pass-through by handset manufacturers is required. To estimate the percentage of any overcharge that MetroPCS would have passed on to its customers, an estimate of pass-through by MetroPCS is required.

313. With regard to pass-through by MetroPCS, the handset sales data that MetroPCS produced do not include handset acquisition costs. This means that it would be necessary to map handset purchases in MetroPCS's purchases data to handset sales in MetroPCS's sales data. This would result in measurement error. The mapping of handset purchases from one data source to handset sales in another data source would be imprecise. AT&T, a competing wireless carrier, produced matched price-cost data. In our opinion, the AT&T data are more

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[284] Douglas Glen MetroPCS Deposition, October 26, 2012, p. 100:16-21.

> Q. How did MetroPCS make decisions about the suggested retail price? A. We'd have the price we paid from the OEM and the standard approach of approximately $20 added to that price that we pay for the phone to create the suggested retail price.

[285] Plaintiffs' expert Prof. Marx agrees that this sort of "cost-plus pricing" would "deliver a 100 percent pass-through rate." See Marx Deposition, October 9, 2013, p. 224:13-21.

> Q. And I believe earlier today you also agreed that cost-plus pricing results in at least 100 percent pass-through, correct? A. If you saw the cost-plus pricing like what was described by Dr. Mallinson, that was an example where the phones were being sold at cost plus a handling charge of I think it was $5 or $10. That would deliver a 100 percent pass-through rate.

reliable than the MetroPCS data, and so we use the AT&T data to estimate pass-through by MetroPCS.[286, 287, 288]

314. We report our estimates of pass-through in Table VII.5. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimate of pass-through by handset manufacturers is 104 percent. Our estimate of pass-through by MetroPCS is 76 percent.[289, 290]

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[286] MetroPCS and AT&T are what economists call "differentiated competitors." They do not offer identical products and services. In theory, such differences could translate into different average pass-through rates. Any such differences are likely to be small, however. Average pass-through is largely a market-wide phenomenon; it depends on competition and demand. There is no reason to expect that competition and demand are significantly different for MetroPCS and AT&T. Furthermore, any potential difference between AT&T and MetroPCS's pass-through rates needs to be compared to the potential error associated with using price and cost data from different sources. There is no reason to expect that AT&T's pass-through rate would be systematically higher or lower than MetroPCS's pass-through rate. Using price and cost data from different sources can be expected to yield an estimate of MetroPCS's pass-through that is biased downward.

[287] Douglas Glen MetroPCS Deposition, October 26, 2012, p. 81:19-23. "Q. Did MetroPCS consider the Tier 1 service providers its competitors? A. Wireless is a very competitive space, and I would consider anyone who is able to offer a wireless product a competitor.; MetroPCS Communications, Inc. Form 10-K, for the fiscal year ended December 31, 2004, p. 22 ("We compete directly in each of our markets with … wireless providers, such as Verizon Wireless, Cingular Wireless, Sprint, Nextel, and T-Mobile… and wireline providers, such as AT&T, Verizon and Bellsouth, as a mobile alternative to traditional landline service.")

[288] Some of AT&T's handsets were sold through agents (e.g., mall kiosks). We understand that AT&T had contracts with such agents. Per these contracts, AT&T sold handsets to the agents at AT&T's acquisition cost plus a handling fee (see Deposition of Andrew Wilson, AT&T 30(b)(6), In Re: TFT-LCD (Flat Panel) Antitrust Litigation, No. 3:07-MD-1827-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, August 9, 2011, pp. 129-135.) AT&T's pass-through on these transactions would have been 100 percent. While MetroPCS' pricing practices are similar to such contracts, we understand that MetroPCS did not have explicit agreements with retailers of this nature. Because MetroPCS did not sell handsets to retailers using such contracts, we remove these transactions from the AT&T data.

[289] Prof. Marx's opinion is that pass-through by wireless carriers, including MetroPCS, is 100 percent. See Marx Deposition, October 9, 2013, pp. 220:16-221:5.

> Q. So do you recall in your previous deposition you stated that, quote: Wireless carriers, going from their purchases of mobile phones to their sales to large resellers, such as the plaintiffs, they would have pass-through 100 percent of variations in cost in the range of that? […] A. I agree.

[290] The handset models that MetroPCS and AT&T purchased and sold are not identical. We also estimated pass-through to and by MetroPCS using sales data from Motorola and AT&T restricting to handset models MetroPCS purchased. Our estimate of pass-through by Motorola is 134 percent and

Table VII.5
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to MetroPCS

Application	LCD Product Manufacturer Pass-Through [To]	Wireless Carrier Pass-Through [By]
Mobile Phones	104%	76%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by Motorola (see Exhibit VII.1 for the number of observations and standard errors). Pass-through by MetroPCS is estimated using sales data provided by AT&T (see Exhibit VII.5). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

315. We have been instructed by counsel to calculate the dollar value of MetroPCS's direct purchases of alleged conspirator LCD panels, during the Conspiracy Period.[291] We have also been instructed to use this as our estimate of MetroPCS's direct volume of commerce. We estimate that MetroPCS's direct volume of commerce is $5,800,019 during both the Conspiracy Period and the Plea Period.

316. We have been instructed by counsel to calculate the dollar value of MetroPCS's indirect purchases of alleged conspirator LCD panels, during the Conspiracy Period and to use this as our estimate of MetroPCS's indirect volume of commerce. We estimate that MetroPCS's indirect volume of commerce is $31,475,164 during both the Conspiracy Period and the Plea Period.

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our estimate of pass-through by AT&T is 90 percent. Details of these estimates are available in the backup materials to this report.

[291] Appendix E.8 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the MetroPCS matter. Appendix E.8 also describes how we estimate MetroPCS's volume of commerce and damages.

317. We understand that Prof. Carlton's estimate of panel overcharges is 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of MetroPCS's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

318. We estimate that MetroPCS's direct damages are $110,200 during both the Conspiracy Period and the Plea Period. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to MetroPCS, one minus our estimate of pass-through by MetroPCS, and MetroPCS's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to MetroPCS x (1 – pass-through by MetroPCS)

319. We estimate that MetroPCS's indirect damages are $144,307 during both the Conspiracy Period and the Plea Period.

ix. TracFone

320. TracFone is a wireless carrier that sells both mobile phones and wireless minutes to retailers and end purchasers. TracFone is claiming damages on purchases of handsets from LG Electronics and third party handset manufacturers.[292] During the period of the alleged conspiracy, TracFone's purchases of mobile phones accounted for 0.46 percent of all small STN-LCD and TFT-LCD panels sold worldwide.[293] TracFone did not purchase large-panel products and mainly purchased handsets made with STN-LCD panels.

321. TracFone purchased handsets from handset manufacturers and sold these handsets to retailers and end consumers. TracFone also sold wireless minutes through pre-paid calling cards. Figure VII.9 shows TracFone's position in the relevant supply chain.

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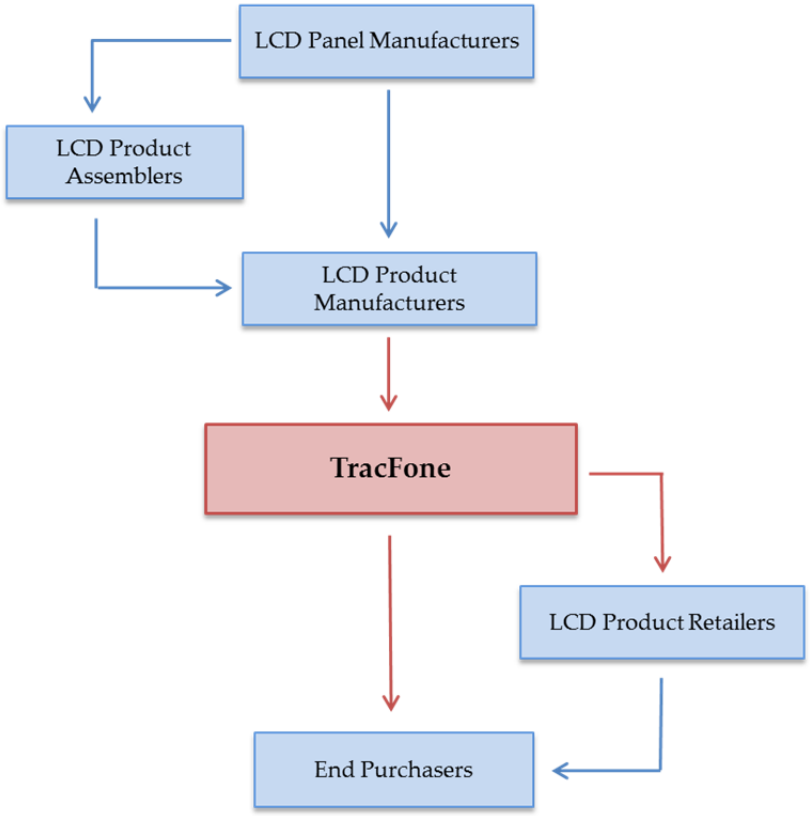
[292] Blair Declaration, June 6, 2013, ¶¶7, 151.

[293] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.9: TracFone's Position in the Supply chain



322. To estimate the percentage of any panel overcharge that TracFone would have paid, an estimate of pass-through by handset manufacturers is required. To estimate the percentage of any overcharge that TracFone would have passed on, an estimate of pass-through by TracFone is required.

323. With regard to pass-through by TracFone, we do not have data on the prices that TracFone charged for wireless minutes. This means that we cannot estimate TracFone's pass-through into wireless minutes. Consequently, we expect to underestimate the percentage of any overcharge that TracFone would have passed on to its customers.

324. The handset sales data that TracFone produced also do not include handset acquisition costs. This means that it would be necessary to map handset purchases in TracFone's purchases data to handset sales in TracFone's sales data. This would result in measurement error though. The mapping of handset purchases from one data source to handset sales in another data source would be imprecise. AT&T, a competing wireless carrier, produced

sales data that include acquisition costs. In our opinion, the AT&T data are more reliable than the TracFone data, and so we use the AT&T data to estimate pass-through by TracFone.[294,295,296]

325. We report our estimates of pass-through in Table VII.6. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimate of pass-through by handset manufacturers is 104 percent. Our estimate of pass-through by TracFone into handset prices is 76 percent.[297, 298]

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294 TracFone and AT&T are what economists call "differentiated competitors." They do not offer identical products. Such differences could translate into different average pass-through rates. Any such difference is likely to be small, however. Average pass-through is largely a market-wide phenomenon; it depends on competition and demand. There is no reason to expect that these factors are significantly different for TracFone and AT&T. Furthermore, any potential difference between AT&T's and TracFone's pass-through rates needs to be compared to the potential error associated with using price and cost data from different sources. There is no reason to expect that AT&T's pass-through rate would be systematically higher or lower than TracFone's pass-through rate. Using price and cost data that are from different sources data can be expected to yield an estimate of pass-through that is biased downward.

295 Deposition of Jim Ruth, TracFone 30(b)(6), *In Re: TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, September 13, 2011, pp. 132:18-133

> Q. And my question was, who are TracFone's primary competitors with respect to your sales to the retail -- retailer customers? A. During this period of time, the major cellular carriers, there were a variety of prepaid competitors over the years, a lot have come and gone, such as -- like a Virgin Mobile, Metro PCS, those types. But for the most part is -- our major competitors are the major carriers in the U.S.

América Móvil Form 20-F, July 2, 2001, For Fiscal Year Ended December 31, 2000, p. 35 ("TracFone's principal competitors are major U.S. wireless operators, including Verizon Wireless, AT&T Wireless, Sprint PCS, VoiceStream Wireless [a/k/a T-Mobile] and Cingular Wireless.")

296 Some of AT&T's handsets were sold through agents (e.g., mall kiosks). We understand that AT&T had contracts with such agents. Per these contracts, AT&T sold handsets to the agents at AT&T's acquisition cost plus a handling fee (see Deposition of Andrew Wilson, AT&T 30(b)(6), In Re: TFT-LCD (Flat Panel) Antitrust Litigation, No. 3:07-MD-1827-SI, MDL No. 1827, United States District Court, Northern District of California, San Francisco Division, August 9, 2011, pp. 129-135.) AT&T's pass-through on these transactions would have been 100 percent. Because TracFone did not sell handsets to retailers using such contracts, we remove these transactions from the AT&T data.

297 Prof. Marx's opinion is that pass-through by wireless carriers, including TracFone, is 100 percent. See Marx Deposition, October 9, 2013, pp. 220:16-221:5

Table VII.6
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to TracFone

Application	LCD Product Manufacturer Pass-Through [To]	Wireless Carrier Pass-Through [By]
Mobile Phones	104%	76%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by Motorola (see Exhibit VII.1 for the number of observations and standard errors). Pass-through by TracFone is estimated using sales data provided by AT&T (see Exhibit VII.5). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

326. We have been instructed by counsel to calculate the dollar value of TracFone's direct purchases of alleged conspirator LCD panels during the Conspiracy Period.[299] We have also been instructed to use this as our estimate of TracFone's direct volume of commerce. We estimate that TracFone's direct volume of commerce is $1,085,159 during both the Conspiracy Period and the Plea Period when using DisplaySearch data to calculate the share of panels manufactured by alleged conspirators. We have also been instructed by counsel to present an alternative calculation of TracFone's direct volume of commerce given that TracFone's direct purchases consist of only one handset model: the LG 3280. This handset

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Q. So do you recall in your previous deposition you stated that, quote: Wireless carriers, going from their purchases of mobile phones to their sales to large resellers, such as the plaintiffs, they would have pass-through 100 percent of variations in cost in the range of that? […] A. I agree.

[298] The handset models that TracFone and AT&T purchased and sold are not identical. We also estimated pass-through to and by TracFone using sales data from Motorola and AT&T restricting to handset models that TracFone purchased. Our estimate of pass-through by Motorola is 54 percent and our estimate of pass-through by AT&T is 53 percent. Details of these estimates are available in the backup materials of this report.

[299] Appendix E.9 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the TracFone matter. Appendix E.9 also describes how we estimate TracFone's volume of commerce and damages.

model contained a panel that was manufactured exclusively by a non-conspirator.[300] Therefore, an alternative estimate of TracFone's direct volume of commerce is $0.

327. We have been instructed by counsel to calculate the dollar value of TracFone's indirect purchases of alleged conspirator LCD panels during the Conspiracy Period. We have also been instructed to use this as our estimate of TracFone's indirect volume of commerce. We estimate that TracFone's indirect volume of commerce is $103,257,037 during the Conspiracy Period and $98,237,037 during the Plea Period.

328. We understand that Prof. Carlton's estimate of panel overcharges is 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of TracFone's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

329. We estimate that TracFone's direct damages are $20,618 during both the Conspiracy Period and the Plea Period if we apply a market wide conspirator panel share estimated using DisplaySearch data. Alternatively, we estimate that TracFone's direct damages are $0 because none of TracFone's direct purchases of handsets included panels that were manufactured by a conspirator. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to TracFone, one minus our estimate of pass-through by TracFone, and TracFone's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to TracFone x (1 – pass-through by TracFone)

330. We estimate that TracFone's indirect damages are $473,411 during the Conspiracy Period and $450,395 during the Plea Period.

[300] Wonseok Lee Declaration, ¶¶6-8.

H. LCD Product Retailer Plaintiffs

x. ABC Warehouse

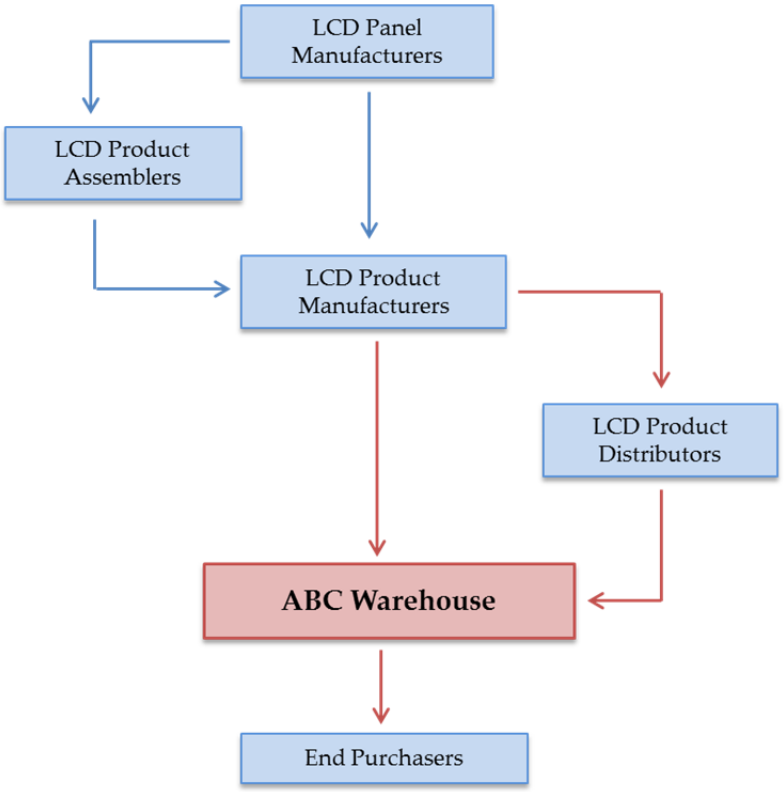
331. ABC Warehouse is a Michigan-based appliance and electronics retailer with additional locations in Indiana and Ohio. ABC Warehouse is claiming damages on purchases of LCD products from alleged conspirators and alleged affiliates and third party LCD product manufacturers and distributors.[301] During the period of the alleged conspiracy, ABC Warehouse's purchases accounted for 0.01 percent of all large LCD panels and 0.01 percent of all small LCD panels sold worldwide.[302]

332. ABC Warehouse purchased digital camcorders, digital cameras, monitors, media players, notebooks, portable DVD players and televisions from LCD product manufacturers, and digital cameras and notebooks from LCD product distributors. ABC Warehouse then sold these LCD products to end purchasers. Figure VII.10 shows ABC Warehouse's position in the relevant supply chain.

[301] Marx P.C. Richard et al. Report, June 13, 2013, ¶13.

[302] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.10: ABC Warehouse's Position in the Supply Chain



333. To estimate the percentage of any panel overcharge that ABC Warehouse would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that ABC Warehouse would have passed on to its customers, an estimate of pass-through by ABC Warehouse is required.

334. We report our estimates of pass-through in Table VII.7. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 112 percent. Our estimates of pass-through by ABC Warehouse range from 78 percent to 122 percent.

Table VII.7
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to ABC Warehouse

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	ABC Warehouse Pass-Through [By]
Digital Camcorders	65%	95%	116%
Digital Cameras	50%	99%	97%
Monitors	99%	112%	84%
Notebooks	78%	109%	78%
Portable DVD Players	89%	106%	122%
Televisions	105%	106%	114%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by ABC Warehouse is estimated using sales data provided by ABC Warehouse (see Exhibit VII.6). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of portable DVD players by LCD product manufacturers were not available to measure pass-through. Pass-through by LCD product manufacturers on sales of portable DVD players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales of all applications.

[3] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by LCD product distributors on sales of notebooks is assumed to be equal to the average pass-through rate by DBL Distributing on sales of all applications.

335. We have been instructed by counsel to calculate the dollar value of ABC Warehouse's direct purchases of alleged conspirator LCD panels during the Conspiracy Period.[303] We have also been instructed to use this as our estimate of ABC Warehouse's direct volume of commerce.

[303] Appendix E.10 lists the parties that we have been instructed by counsel to assume are alleged conspirators or alleged affiliates in the ABC Warehouse matter. Appendix E.10 also describes how we estimate ABC Warehouse's volume of commerce and damages.

We estimate that ABC Warehouse's direct volume of commerce is $18,910,302 during the Conspiracy Period and $17,561,805 during the Plea Period.

336. We have been instructed by counsel to calculate the dollar value of ABC Warehouse's indirect purchases of alleged conspirator LCD panels during the Conspiracy Period. We have also been instructed to use this as our estimate of ABC Warehouse's indirect volume of commerce. We estimate that ABC Warehouse's indirect volume of commerce is $22,595,461 during the Conspiracy Period and $21,412,363 during the Plea Period.

337. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of ABC Warehouse's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

338. We estimate that ABC Warehouse's direct damages are $113,841 during the Conspiracy Period and $89,452 during the Plea Period.

339. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to ABC Warehouse,[304] one minus our estimate of pass-through by ABC Warehouse, and ABC Warehouse's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to ABC Warehouse x (1 – pass-through by ABC Warehouse)

340. We estimate that ABC Warehouse's indirect damages are $2,874 during the Conspiracy Period and $2,629 during the Plea Period.

[304] For LCD product purchases from LCD product manufacturers, our estimate of pass-through to ABC Warehouse is the estimate of pass-through by LCD product manufacturers. For LCD product purchases from LCD product distributors, our estimate of pass-through to ABC Warehouse is the estimate of pass-through by LCD product manufacturers times the estimate of pass-through by LCD product distributors.

xi. BrandsMart

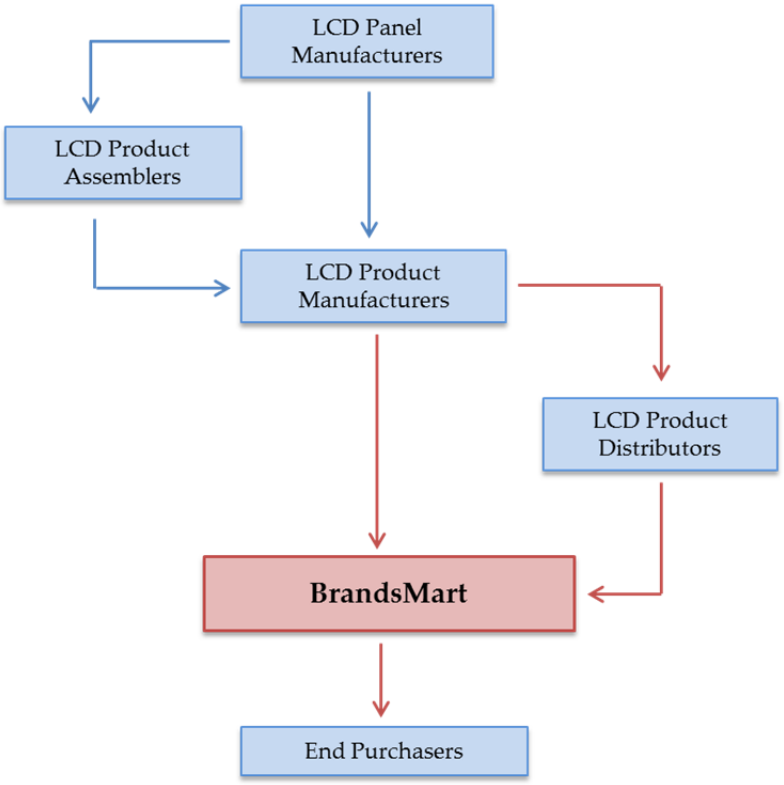
341. BrandsMart is a Florida-based appliance and electronics retailer with additional locations in Georgia. BrandsMart is claiming damages on purchases of LCD products from alleged conspirators and alleged affiliates and third party LCD product manufacturers and distributors.[305] During the period of the alleged conspiracy, BrandsMart's purchases accounted for 0.06 percent of all large LCD panels and 0.04 percent of all small LCD panels sold worldwide.[306]

342. BrandsMart purchased digital camcorders, digital cameras, monitors, media players, notebooks, portable DVD players and televisions from LCD product manufacturers, and digital cameras, digital camcorders, monitors, notebooks, and televisions from LCD product distributors. BrandsMart then sold these LCD products to end purchasers. Figure VII.11 shows BrandsMart's position in the relevant supply chain.

[305] Marx BrandsMart Report, June 13, 2013, ¶13.

[306] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.11: BrandsMart's Position in the Supply Chain



343. To estimate the percentage of any panel overcharge that BrandsMart would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that BrandsMart would have passed on to its customers, an estimate of pass-through by BrandsMart is required.

344. We report our estimates of pass-through in Table VII.8, below. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 109 percent. Our estimates of pass-through by BrandsMart range from 77 percent to 125 percent.

Table VII.8
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to BrandsMart

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	BrandsMart Pass-Through [By]
Digital Camcorders	65%	95%	120%
Digital Cameras	50%	99%	99%
Monitors	99%	112%	114%
Notebooks	78%	109%	77%
Televisions	105%	106%	125%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by BrandsMart is estimated using sales data provided by BrandsMart (see Exhibit VII.7). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by LCD product distributors on sales of notebooks is assumed to be equal to the pass-through rate by DBL Distributing on sales of all applications.

345. We have been instructed by counsel to calculate the dollar value of BrandsMart's direct purchases of alleged conspirator LCD panels during the Conspiracy Period. We have also been instructed to use this as our estimate of BrandsMart's direct volume of commerce. We estimate that BrandsMart's direct volume of commerce is $97,729,784 during the Conspiracy Period and $95,420,934 during the Plea Period.

346. We have been instructed by counsel to calculate the dollar value of BrandsMart's indirect purchases of alleged conspirator LCD panels during the Conspiracy Period.[307] We have also

[307] Appendix E.11 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the BrandsMart matter. Appendix E.11 also describes how we estimate BrandsMart's volume of commerce and damages.

been instructed to use this as our estimate of BrandsMart's indirect volume of commerce. We estimate that BrandsMart's indirect volume of commerce is $76,388,911 during the Conspiracy Period and $68,628,258 during the Plea Period.

347. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of BrandsMart's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

348. We estimate that BrandsMart's direct damages are $460,010 during the Conspiracy Period and $420,423 during the Plea Period. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to BrandsMart,[308] one minus our estimate of pass-through by BrandsMart, and BrandsMart's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to BrandsMart x (1 – pass-through by BrandsMart)

349. We estimate that BrandsMart's indirect damages are $12,740 during the Conspiracy Period and $9,134 during the Plea Period.

xii. Circuit City

350. Circuit City was a national electronics retailer based in Virginia that filed for Chapter 11 bankruptcy protection in November 2008. Circuit City is claiming damages on purchases of LCD products from alleged conspirators and alleged affiliates and third party LCD product manufacturers and distributors.[309] During the period of the alleged conspiracy, Circuit

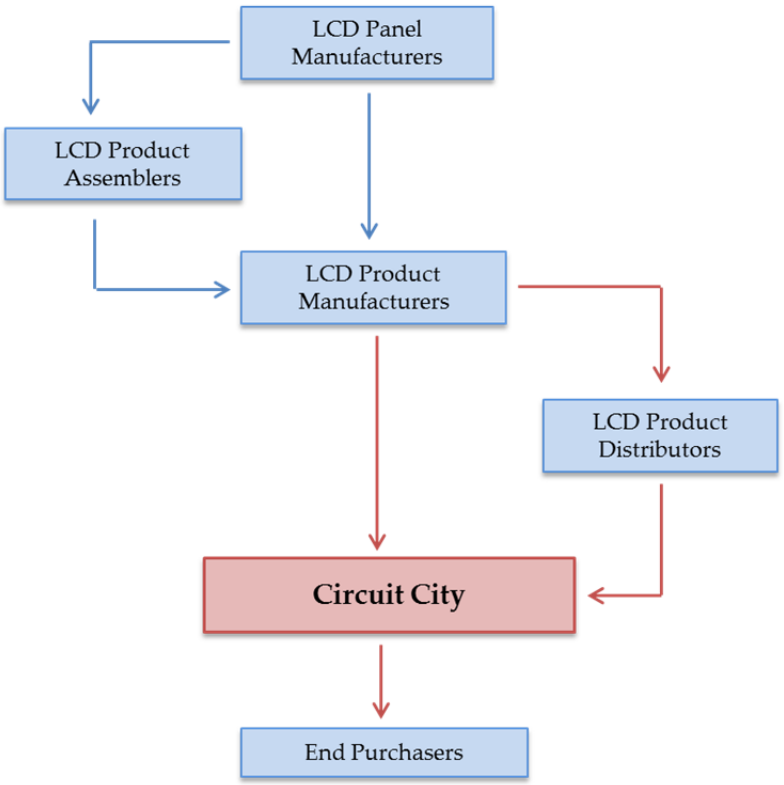
[308] For LCD product purchases from LCD product manufacturers, our estimate of pass-through to BrandsMart is the estimate of pass-through by LCD product manufacturers. For LCD product purchases from LCD product distributors, our estimate of pass-through to BrandsMart is the estimate of pass-through by LCD product manufacturers times the estimate of pass-through by LCD product distributors.

[309] Marx Circuit City Report, June 13, 2013, ¶13.

City's purchases accounted for 1.22 percent of all large LCD panels and 0.75 percent of all small LCD panels sold worldwide.[310]

351. Circuit City purchased digital camcorders, digital cameras, monitors, media players, notebooks, portable DVD players and televisions from LCD product manufacturers, and digital camcorders, digital cameras, monitors, notebooks, portable DVD players and televisions from LCD product distributors. Circuit City then sold these LCD products to end purchasers. Figure VII.12 shows Circuit City's position in the relevant supply chain.

Figure VII.12: Circuit City's Position in the Supply Chain



352. To estimate the percentage of any panel overcharge that Circuit City would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that Circuit City would have passed on to its customers, an estimate of pass-through by Circuit City is required.

[310] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

353. We report our estimates of pass-through in Table VII.9, below. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 112 percent. Our estimates of pass-through by Circuit City range from 98 percent to 132 percent.

Table VII.9
Summary of Pass-Through Rates Used to Estimate Indirect Damages to Circuit City

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	Circuit City Pass-Through [By]
Digital Camcorders	65%	95%	120%
Digital Cameras	50%	99%	111%
Monitors	99%	112%	109%
Notebooks	78%	109%	98%
Portable DVD Players	89%	106%	102%
Televisions	105%	106%	132%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by Circuit City is estimated using sales data provided by Circuit City (see Exhibit VII.8). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of portable DVD players by LCD product manufacturers were not available to measure pass-through. Pass-through by LCD product manufacturers on sales of portable DVD players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales of all applications.

[3] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by LCD product distributors on sales of notebooks is assumed to be equal to the average pass-through rate by DBL Distributing on sales of all applications.

354. We have been instructed by counsel to calculate the dollar value of Circuit City's direct purchases of alleged conspirator LCD panels, during the Conspiracy Period.[311] We have also been instructed to use this as our estimate of Circuit City's direct volume of commerce. We estimate that Circuit City's direct volume of commerce is $1,097,794,669 during the Conspiracy Period and $992,298,665 during the Plea Period.

355. We have been instructed by counsel to calculate the dollar value of Circuit City's indirect purchases of alleged conspirator LCD panels, during the Conspiracy Period. We have also been instructed to use this as our estimate of Circuit City's indirect volume of commerce. We estimate that Circuit City's indirect volume of commerce is $1,955,215,353 during the Conspiracy Period and $1,708,883,736 during the Plea Period.

356. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of Circuit City's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

357. We estimate that Circuit City's direct damages are $5,279,578 during the Conspiracy Period and $4,429,712 during the Plea Period. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to Circuit City,[312] one minus our estimate of pass-through by Circuit City, and Circuit City's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to Circuit City x (1 – pass-through by Circuit City)

358. We estimate that Circuit City's indirect damages are $46,926 during the Conspiracy Period and $35,784 during the Plea Period.

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[311] Appendix E.12 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the Circuit City matter. Appendix E.12 also describes how we estimate Circuit City's volume of commerce and damages.

[312] For LCD product purchases from LCD product manufacturers, our estimate of pass-through to Circuit City is the estimate of pass-through by LCD product manufacturers. For LCD product purchases from LCD product distributors, our estimate of pass-through to Circuit City is the estimate of pass-through by LCD product manufacturers times the estimate of pass-through by LCD product distributors.

xiii. Office Depot

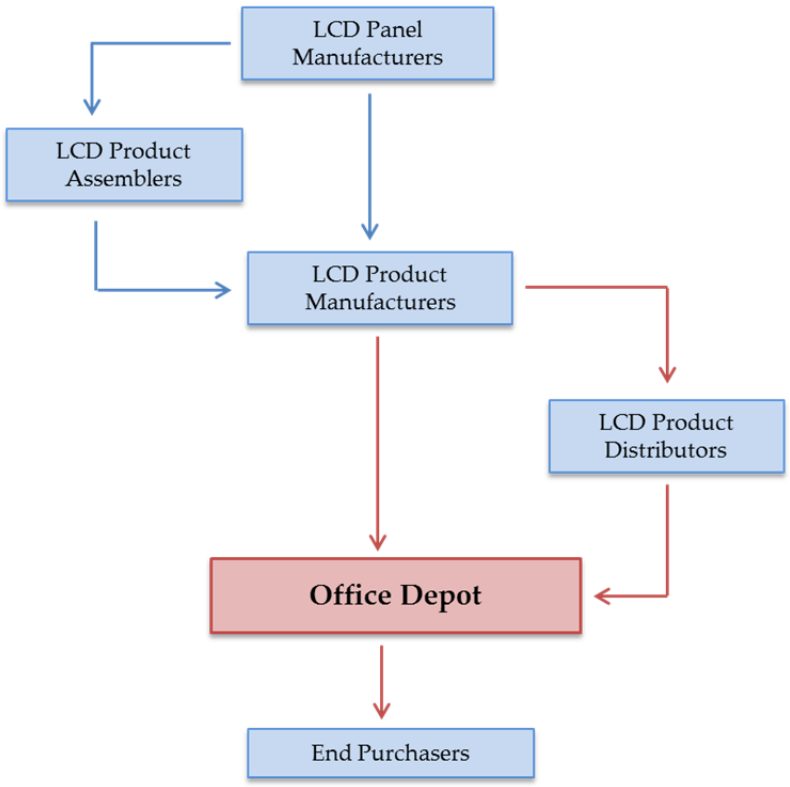
359. Office Depot is a national retailer of office products that is based in Florida. Office Depot is claiming damages on purchases of LCD products from alleged conspirators and alleged affiliates and third party LCD product manufacturers and distributors.[313] During the period of the alleged conspiracy, Office Depot's purchases accounted for 0.29 percent of all large LCD panels and 0.03 percent of all small LCD panels sold worldwide.[314]

360. Office Depot purchased digital camcorders, digital cameras, monitors, media players, notebooks, portable DVD players and televisions from LCD product manufacturers, and digital cameras and media players from LCD product distributors. Office Depot then sold these LCD products to end purchasers. Figure VII.13 shows Office Depot's position in the relevant supply chain.

[313] Marx Office Depot Report, June 13, 2013, ¶13.

[314] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.13: Office Depot's Position in the Supply Chain



361. To estimate the percentage of any panel overcharge that Office Depot would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that Office Depot would have passed on to its customers, an estimate of pass-through by Office Depot is required.

362. We report our estimates of pass-through in Table VII.10, below. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 112 percent. Our estimates of pass-through by Office Depot range from 13 percent to 102 percent.

Table VII.10
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to Office Depot

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	Office Depot Pass-Through [By]
Digital Camcorders	65%	95%	49%
Digital Cameras	50%	99%	83%
Monitors	99%	112%	102%
Notebooks	78%	109%	60%
Televisions	105%	106%	13%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by Office Depot is estimated using sales data provided by Office Depot (see Exhibit VII.9). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by LCD product distributors on sales of notebooks is assumed to be equal to the average pass-through rate by DBL Distributing on sales of all applications.

363. We have been instructed by counsel to calculate the dollar value of Office Depot's direct purchases of alleged conspirator LCD panels, during the Conspiracy Period.[315] We have also been instructed to use this as our estimate of Office Depot's direct volume of commerce. We estimate that Office Depot's direct volume of commerce is $165,095,100 during the Conspiracy Period and $156,553,087 during the Plea Period.

364. We have been instructed by counsel to calculate the dollar value of Office Depot's indirect purchases of alleged conspirator LCD panels, during the Conspiracy Period. We have also been instructed to use this as our estimate of Office Depot's indirect volume of commerce.

[315] Appendix E.13 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the Office Depot matter. Appendix E.13 also describes how we estimate Office Depot's volume of commerce and damages.

We estimate that Office Depot's indirect volume of commerce is $288,838,206 during the Conspiracy Period and $263,481,874 during the Plea Period.

365. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of Office Depot's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

366. We estimate that Office Depot's direct damages are $664,792 during the Conspiracy Period and $630,192 during the Plea Period. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to Office Depot,[316] one minus our estimate of pass-through by Office Depot, and Office Depot's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to Office Depot x (1 – pass-through by Office Depot)

367. We estimate that Office Depot's indirect damages are $247,747 during the Conspiracy Period and $229,204 during the Plea Period.

xiv. P.C. Richard

368. P.C. Richard is a New York-based appliance and electronics retailer with additional locations in Connecticut, New Jersey and Pennsylvania. P.C. Richard is claiming damages on purchases of LCD products from alleged conspirators and alleged affiliates and third party LCD product manufacturers and distributors.[317] During the period of the alleged

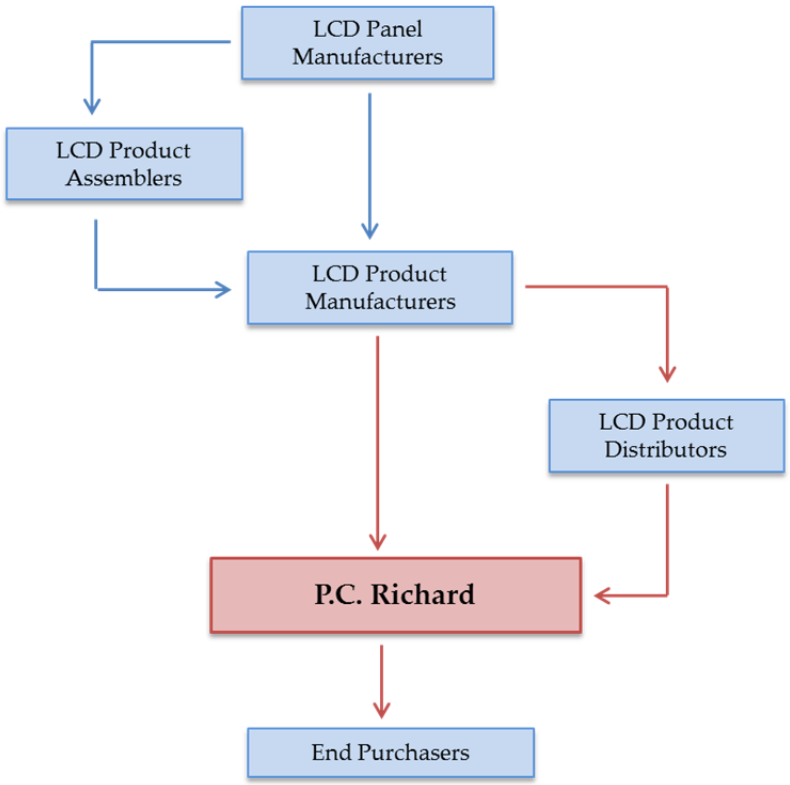
[316] For LCD product purchases from LCD product manufacturers, our estimate of pass-through to Office Depot is the estimate of pass-through by LCD product manufacturers. For LCD product purchases from LCD product distributors, our estimate of pass-through to Office Depot is the estimate of pass-through by LCD product manufacturers times the estimate of pass-through by LCD product distributors.

[317] Marx P.C. Richard et al. Report, June 13, 2013, ¶13.

conspiracy, P.C. Richard's purchases accounted for 0.06 percent of all large LCD panels and 0.03 percent of all small LCD panels sold worldwide.[318]

369. P.C. Richard purchased digital camcorders, digital cameras, monitors, media players, notebooks, portable DVD players and televisions from LCD product manufacturers and digital cameras, monitors, media players, notebooks, portable DVD players and televisions from LCD product distributors. P. C. Richard then sold these LCD products to end purchasers. Figure VII.14 shows P.C. Richard's position in the relevant supply chain.

Figure VII.14: P.C. Richard's Position in the Supply Chain



370. To estimate the percentage of any panel overcharge that P.C. Richard would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that P.C. Richard would have passed on to its customers, an estimate of pass-through by P.C. Richard is required.

[318] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

371. We report our estimates of pass-through in Table VII.11, below. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 112 percent. Our estimates of pass-through by P.C. Richard range from 76 percent to 126 percent.

Table VII.11
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to P.C. Richard

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	P. C. Richard Pass-Through [By]
Digital Camcorders	65%	95%	105%
Digital Cameras	50%	99%	76%
Monitors	99%	112%	112%
MP3/Media Players	89%	101%	98%
Notebooks	78%	109%	83%
Portable DVD Players	89%	106%	126%
Televisions	105%	106%	109%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by P.C. Richard is estimated using sales data provided by P.C. Richard (see Exhibit VII.10). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of portable DVD players and MP3/media players by LCD product manufacturers were not available to measure pass-through. Pass-through by LCD product manufacturers on sales of portable DVD players and MP3/media players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales of all applications.

[3] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by LCD product distributors on sales of notebooks is assumed to be equal to the average pass-through rate by DBL Distributing on sales of all applications.

372. We have been instructed by counsel to calculate the dollar value of P.C. Richard's direct purchases of alleged conspirator LCD panels during the Conspiracy Period.[319] We have also been instructed to use this as our estimate of P.C. Richard's direct volume of commerce. We estimate that P.C. Richard's direct volume of commerce is $100,577,049 during the Conspiracy Period and $97,139,210 during the Plea Period.

373. We have been instructed by counsel to calculate the dollar value of P.C. Richard's indirect purchases of alleged conspirator LCD panels during the Conspiracy Period. We have also been instructed to use this as our estimate of P.C. Richard's indirect volume of commerce. We estimate that P.C. Richard's indirect volume of commerce is $98,745,190 during the Conspiracy Period and $90,515,808 during the Plea Period.

374. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of P.C. Richard's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

375. We estimate that P.C. Richard's direct damages are $499,101 during the Conspiracy Period and $434,866 during the Plea Period. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to P.C. Richard,[320] one minus our estimate of pass-through by P.C. Richard, and P.C. Richard's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to P.C. Richard x (1 – pass-through by P.C. Richard)

376. We estimate that P.C. Richard's indirect damages are $20,592 during the Conspiracy Period and $16,050 during the Plea Period.

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[319] Appendix E.14 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the P.C. Richard matter. Appendix E.14 also describes how we estimate P.C. Richard's volume of commerce and damages.

[320] For LCD product purchases from LCD product manufacturers, our estimate of pass-through to P.C. Richard is the estimate of pass-through by LCD product manufacturers. For LCD product purchases from LCD product distributors, our estimate of pass-through to P.C. Richard is the estimate of pass-through by LCD product manufacturers times the estimate of pass-through by LCD product distributors.

xv. Tweeter

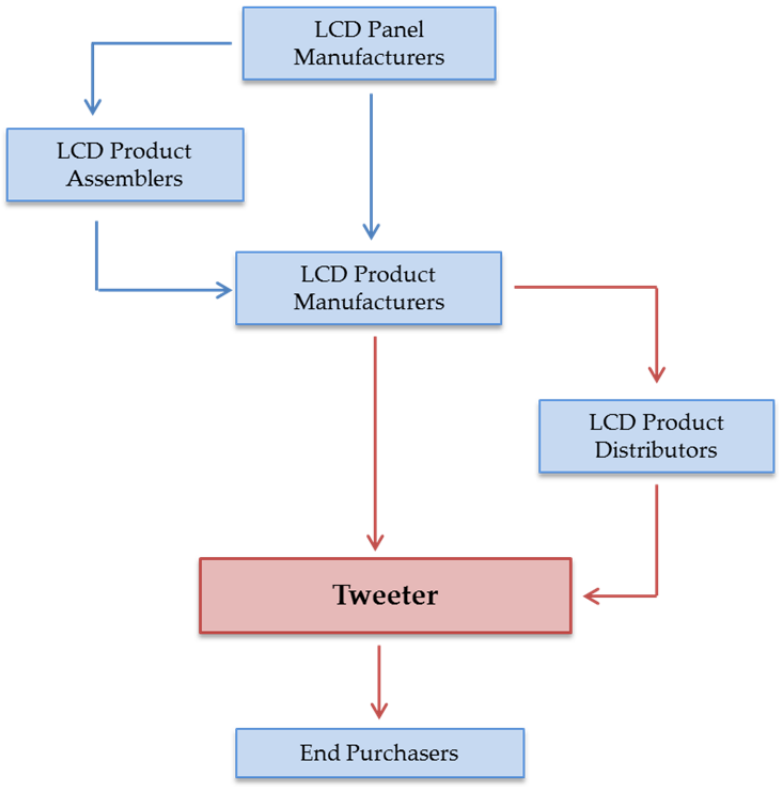
377. Tweeter was a Massachusetts-based consumer electronics retailer with locations across the U.S. Tweeter filed for Chapter 11 bankruptcy protection in 2007, and filed for bankruptcy in 2008. Tweeter is claiming damages on purchases of LCD products from alleged conspirators and alleged affiliates and third party LCD product manufacturers and distributors.[321] During the period of the alleged conspiracy, Tweeter's purchases accounted for 0.02 percent of all large LCD panels and 0.01 percent of all small LCD panels sold worldwide.[322]

378. Tweeter purchased digital camcorders, digital cameras, media players, monitors, portable DVD players and televisions from LCD product manufacturers, and digital camcorders, digital cameras, media players, and televisions from LCD product distributors. Tweeter then sold these LCD products to end purchasers. Figure VII.15 shows Tweeter's position in the relevant supply chain.

[321] Marx Tweeter Report, June 13, 2013, ¶13.

[322] These shares are calculated by dividing the plaintiff's total unit purchases by worldwide panel sales, using DisplaySearch data ("DISP_LCD-000001.xls"). See report backup materials for additional details.

Figure VII.15: Tweeter's Position in the Supply Chain



379. To estimate the percentage of any panel overcharge that Tweeter would have paid, estimates of pass-through by LCD product manufacturers and LCD product distributors are required. To estimate the percentage of any overcharge that Tweeter would have passed on to its customers, an estimate of pass-through by Tweeter is required.

380. We report our estimates of pass-through in Table VII.12, below. Our preferred specification when estimating pass-through with matched price-cost data is equation 3. (See discussion in Section V.) Our estimates of pass-through by LCD product manufacturers range from 50 percent to 105 percent. Our estimates of pass-through by LCD product distributors range from 95 percent to 112 percent. Our estimates of pass-through by Tweeter range from 58 percent to 107 percent.

Table VII.12
Summary of Pass-Through Rates Used to
Estimate Indirect Damages to Tweeter

Application	LCD Product Manufacturer Pass-Through [To]	LCD Product Distributor Pass-Through [To]	Tweeter Pass-Through [By]
Digital Camcorders	65%	95%	107%
Digital Cameras	50%	99%	107%
Monitors	99%	112%	107%
MP3/Media Players	89%	101%	58%
Notebooks	78%	109%	107%
Televisions	105%	106%	102%

Notes and Sources:

[1] Pass-through by LCD product manufacturers is estimated using sales data provided by LCD product manufacturers (see Exhibit VII.1 for a list of these entities, number of observations and standard errors). Pass-through by LCD product distributors is estimated using sales data provided by DBL Distributing (see Exhibit VII.4). Pass-through by Tweeter is estimated using sales data provided by Tweeter (see Exhibit VII.11). A more detailed description of the data used to estimate pass-through is provided in Appendix K.

[2] Data on sales of MP3/media players by LCD product manufacturers were not available to measure pass-through. Pass-through by LCD product manufacturers on sales of MP3/media players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales of all product types.

[3] Data on sales of notebooks by DBL Distributing were not available to measure pass-through. Pass-through by LCD product distributors on sales of notebooks is assumed to be equal to the average pass-through rate by DBL Distributing on sales of all applications.

[4] Data on sales of digital cameras, monitors and notebooks by Tweeter were not available to measure pass-through. Pass-through by Tweeter on sales of digital camcorders, digital cameras, monitors and notebooks is assumed to be equal to the average pass-through rate by Tweeter on sales of all applications.

381. We have been instructed by counsel to calculate the dollar value of Tweeter's direct purchases of alleged conspirator LCD panels during the Conspiracy Period.[323] We have also

[323] Appendix E.15 lists the parties that we have been instructed by counsel to assume are alleged conspirators and alleged affiliates in the Tweeter matter. Appendix E.15 also describes how we estimate Tweeter's volume of commerce and damages.

been instructed to use this as our estimate of Tweeter's direct volume of commerce. We estimate that Tweeter's direct volume of commerce is $49,278,440 during the Conspiracy Period and $48,201,938 during the Plea Period.

382. We have been instructed by counsel to calculate the dollar value of Tweeter's indirect purchases of alleged conspirator LCD panels during the Conspiracy Period. We have also been instructed to use this as our estimate of Tweeter's indirect volume of commerce. We estimate that Tweeter's indirect volume of commerce is $48,672,292 during the Conspiracy Period and $47,013,055 during the Plea Period.

383. We understand that Prof. Carlton's estimate of panel overcharges is 0.4 percent for large panels and 1.9 percent for small panels. For direct purchases, we multiply Prof. Carlton's panel overcharge estimate and our estimate of Tweeter's direct volume of commerce.

Direct damages = panel overcharge estimate x direct volume of commerce

384. We estimate that Tweeter's direct damages are $217,740 during the Conspiracy Period and $208,493 during the Plea Period. For indirect purchases, we multiply Prof. Carlton's panel overcharge estimate, our estimate of pass-through to Tweeter,[324] one minus our estimate of pass-through by Tweeter, and Tweeter's indirect volume of commerce.

Indirect damages = panel overcharge estimate x indirect volume of commerce x pass-through to Tweeter x (1 – pass-through by Tweeter)

385. We estimate that Tweeter's indirect damages are $1,772 during the Conspiracy Period and $1,766 during the Plea Period.

[324] For LCD product purchases from LCD product manufacturers, our estimate of average pass-through to Tweeter is the estimate of pass-through by LCD product manufacturers. For LCD product purchases from LCD product distributors, our estimate of pass-through to Tweeter is the estimate of pass-through by LCD product manufacturers times the estimate of pass-through by LCD product distributors.

James A. Levinsohn

Edward A. Snyder

October 31, 2013

Exhibit II.1 (Page 1 of 3)
Selected TFT-LCD Panel Manufacturers: Timelines Regarding Entry, Exit, Mergers, and Joint Ventures
1996 - 2006

Non-conspirator or subsidiary/joint venture stake owned by non-conspirator

Alleged conspirator or wholly owned subsidiary of alleged conspirator

Group #	Panel Manufacturer Name	Country	1996				1997				1998				1999				2000				2001				2002				2003				2004				2005				2006			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
[1]	Toshiba	Japan																																											
	Panasonic	Japan																																											
	TM Display	Japan																																											
	Display Technology Inc. (DTI)	Japan																																											
	Jilin	China																																											
[2]	Hitachi	Japan																																											
	Hitachi Displays	Japan																																											
	IPS Alpha	Japan																																											
[3]	Sharp	Japan																																											
	Fujitsu	Japan																																											
[4]	Mitsubishi	Japan																																											
	Advanced Display Inc. (ADI)	Japan																																											
[5]	NEC	Japan																																											
	SVA NEC	China																																											
[6]	LG Electronics	Korea																																											
	Koninklijke Philips (Royal Philips)	Netherlands																																											
	Philips Kobe (HAPD)	Japan																																											
	LG Display	Korea																																											
[7]	Samsung SEC	Korea																																											
	Sony	Japan																																											
[8]	BOE Hydis	Korea																																											
[9]	Sanyo Electric	Japan																																											
	Epson Imaging Display Corp.	Japan																																											
[10]	Chunghwa	Taiwan																																											
[11]	Acer	Taiwan																																											
	Unipac	Taiwan																																											
	AUO	Taiwan																																											
	Quanta Display	Taiwan																																											
[12]	Chi Mei	Taiwan																																											
	CMO Japan (ID Tech)	Japan																																											
	Innolux	Taiwan																																											
[13]	HannStar	Taiwan																																											
[14]	Toppoly	Taiwan																																											
	TPO	Taiwan																																											
[15]	InfoVision	China																																											

Exhibit II.1 (Page 2 of 3)
Notes and Sources

Chart Notes:

[1] All large-area TFT-LCD panel manufacturers who appear in the DisplaySearch Panel Shipments data, along with selected affiliated entities, are included in this analysis. Large-area TFT-LCD panels are defined as panels that are greater than or equal to 10 inches diagonally in size.

[2] Manufacturers are defined as alleged conspirators based on plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.

[3] Companies appearing in the same group number have the same color scheme and are related through either a joint venture, merger, or acquisition. The type of relationship between entities is denoted by the pattern style as defined in the legend, and as explained in the company history notes.

[4] From the 4th quarter of 1999 onwards, entry and exit dates are based on the quarter in which large-area TFT-LCD revenues first and last appear for the company in the DisplaySearch Panel Shipments data. Prior to the 4th quarter of 1999, entry and exit dates are based on the mass production ramp up dates reported in the DisplaySearch Quarterly TFT LCD Supply/Demand and Capital Spending Reports. Additional sources such as publicly available investment analyst reports, company timelines, company press releases, and newspaper articles were used to confirm the start and end of TFT-LCD production.

Data Sources for Large-Area Revenues and Fab Mass Production:

[1] DisplaySearch Panel Shipments Data, DISP_LCD-000001.xls; DisplaySearch, Quarterly Large-Area TFT-LCD Shipment Report 2000Q1 - 2007Q1 OEM-based History, September 5, 2007, SECm00092680.

[2] DisplaySearch, DisplaySearch Quarterly TFT LCD/Supply Demand and Capital Spending Report, 2004Q3 and 2006Q3, GRNE0327186 and GRNE0327406.

[3] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

Notes on Company History (Organized by Group Number):

[1] In 1996, Toshiba was mass producing TFT-LCDs through its joint venture with IBM, Display Technology Inc. (DTI), in Japan. Matsushita (now known as Panasonic) was also mass producing TFT-LCDs in 1996.
In 1998, Toshiba and IBM agreed to license their TFT-LCD technology to Jilin Electronics in China and help build a new plant. In 2001, Jilin began mass production of large-area TFT-LCDs.
In August 2001, Toshiba ended their joint venture, DTI, with IBM, but Toshiba retained the Himeji Operations in Japan. In April 2002, Toshiba Matsushita Display Technology Co., Ltd (TM Display) is formed in Japan, a joint venture between Toshiba and Panasonic. AFPD of Singapore, a wholly owned subsidiary of TM Display, also began mass production of TFT-LCDs in 2002.

[2] In 1996, Hitachi of Japan, was mass producing TFT-LCDs. In October 2002, the display business of Hitachi, Ltd. was spun off into a separate company called Hitachi Displays, Ltd.
In October 2004, Hitachi Displays, Toshiba, and Panasonic, agreed to form the joint venture IPS Alpha, which began mass production of TFT-LCDs in 2006.

[3] In 1996 and 1997 respectively, Sharp and Fujitsu of Japan, began mass production of TFT-LCDs. In 2005, Sharp takes over Fujitsu's LCD business.

[4] In 1991, Mitsubishi and Asahi Glass formed a joint venture, Advanced Displays, Inc. (ADI), which began mass production of TFT-LCDs in Japan. Mitsubishi held the majority stake in ADI.
According to DisplaySearch, ADI ceased production of TFT-LCD panels in the 4th quarter of 2002, while Mitsubishi began production of TFT-LCDs in the first quarter of 2003. A Mitsubishi subsidiary, Melco Display Technology, Inc., took over ADI's production facilities and continued Mitsubishi's production of TFT-LCD panels in 2004.

[5] NEC of Japan was mass producing TFT-LCDs in 1996. In 2003, SVA NEC was formed in China, a joint venture between SVA Group and NEC. SVA NEC began mass production of TFT-LCDs in 2004.

[6] In 1996, Hosiden of Japan was mass producing TFT-LCDs. In April 1997, HAPD was formed as a joint venture between Koninklijke Philips (Royal Philips) and Hosiden.
In July 1999, LG.Philips LCD was formed (now known as LG Display), a joint venture between LG Electronics and Philips Electronics.
In September 2000, Philips bought Hosiden's stake in HAPD and renamed the company Philips Components Kobe.

[7] Samsung SEC of Korea was mass producing TFT-LCDs in 1996.
ST-LCD, a joint venture between Sony and Toyota Industries Corp. in Japan, began mass production of TFT-LCDs in 1999.
S-LCD, a joint venture between Sony and Samsung in South Korea, began mass production of TFT-LCDs in 2005.

[8] Hyundai of Korea was mass producing TFT-LCDs in 1996. In 2001, Hynix was spun off of the Hyundai Group of Korea (the TFT-LCD unit of Hynix is called Hydis). In January 2003, BOE Hydis debuts after the BOE Group of China purchased Hydis from Hynix. In 2005, BOE OT, another TFT-LCD division of the BOE Group, began mass production of TFT-LCDs in China. In 2008, the TFT-LCD divisions changed their name to Hydis Technologies, Inc.

[9] Sanyo Electric Co., Ltd. entered the large TFT-LCD panel business in 1996 and began mass production at its Gifu #1 fab in October 1996. Sanyo Epson Imaging Devices Corp. (SEID) began operations in October 2004 as a joint venture between Seiko Epson Corp. and Sanyo Electric. In December 2006, Sanyo Electric sold its share in the joint venture to Seiko Epson Corp., and SEID was renamed Epson Imaging Devices Corp. (EIDC).

[10] Chunghwa Picture Tubes (Chunghwa), of Taiwan, began mass production of TFT-LCDs in 1999.

[11] In 1999 and 2000 respectively, Acer Display Technologies and Unipac Optoelectronics of Taiwan were mass producing TFT-LCDs. In September 2001, Acer merged with Unipac to create AU Optronics, in Taiwan. In 2006, Quanta Display Inc. of Taiwan merged with AU Optronics Corp.

[12] Chi Mei Optoelectronics (CMO), of Taiwan, began mass production of TFT-LCDs in 1999.
In August 2001, CMO and IBM Japan acquired a part of DTI to form a joint venture named IDTech (now known as CMO Japan) in Japan at the Yasu facility. In October 2004, CMO gained 100% ownership of IDTech after acquiring IBM's stake.
In 2005, Japan's Sony purchased the TFT-LCD operations of CMO Japan from CMO and renamed it STMD for use in manufacturing panels for mobile displays.
Innolux Display Corp. of Taiwan, founded in 2003, began mass production of TFT-LCDs in 2004. Chi Mei merged with Innolux and TPO in 2010 and changed its name to Chimei Innolux Corporation.

[13] HannStar Display Corp. of Taiwan was established in 1998 and began commercial production of TFT-LCDs in 2000.

[14] Toppoly of Taiwan, established in 1999, began mass production of TFT-LCDs in 2003.
In 2006, the company merged with Philips Mobile Display Systems. Koninklijke Philips gained a stake in the company and Toppoly changed its name to TPO.

[15] In 2006, InfoVision Optoelectronics of China, a joint venture between Kunshan Economic & Technical Development (KETD) and IVO Holdings, began mass production of TFT-LCDs.

Exhibit II.1 (Page 3 of 3)

Notes and Sources

Sources for Company History (Organized by Group Number):

[1] Brull, Steven, "Unequal Screen Pair: IBM and Toshiba," *International Herald Tribune* , April 16, 1992, http://www.iht.com/articles/1992/04/16/lcd_.php, visited on December 8, 2008; Toshiba Annual Report 2002, p. 29; Toshiba Press Release, "IBM and Toshiba License TFT Liquid Crystal Display Technology to China's Jilin Electronics," *Toshiba* , September 25, 1998, http://www.toshiba.co.jp/about/press/1998_09/pr2501.htm, visited on November 14, 2008; "Milestones," *AFPD.com* , http://www.afpd.com.sg/milestones.html, visited on December 8, 2008.

[2] Hitachi Displays Press Release, "Hitachi, Toshiba and Matsushita Conclude Agreement for Establishment of TV LCD Panel Joint Venture, IPS Alpha Technology," *Hitachi-Displays.com* , October 29, 2004, http://www.hitachi-displays.com/en/news/2016473_18571.html, visited on June 28, 2009; Hitachi Corporate Outline, *Hitachi-Displays.com* , http://www.hitachi-displays.com/en/company/outline/index.html, visited on July 31, 2009.

[3] Guth, Rob, "Fujitsu will sink $300M into TFT LCD buildup," Electronic News, February 13, 1995, http://findarticles.com/p/articles/mi_m0EKF/is_n2052_v41/ai_16854680, visited November 14, 2008; "TFT-LCD Market Outlook," *UBS Warburg* , April 12, 1999, p. 16; Fujitsu Press Release, "Sharp and Fujitsu Announce Agreement on Transfer of Fujitsu's LCD Business," *Fujitsu.com* , February 7, 2005, http://www.fujitsu.com/global/news/pr/archives/month/2005/20050207-02.html, visited on December 9, 2008.

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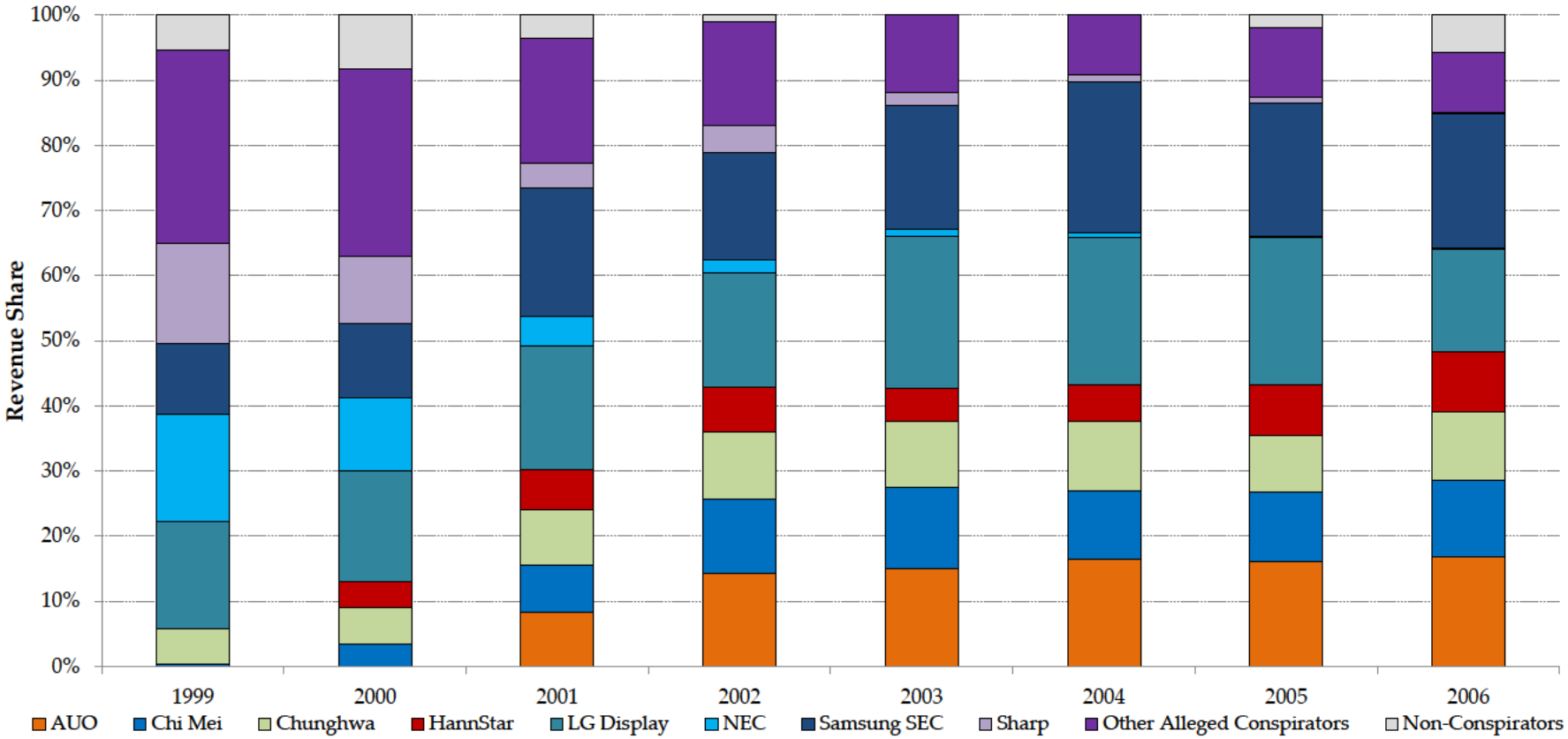
Exhibit II.2
Revenue Shares of LCD Panel Manufacturers (Using DisplaySearch Data)
Large-area TFT-LCD Monitor Panel Sales
1999 - 2006[1]



Notes:

[1] DisplaySearch data for monitors are available starting in the 4th quarter of 1999. Data exclude TFT-LCD panels that are less than 10 inches diagonally in size.

[2] Monitor panel revenue shares are based on worldwide sales expressed in U.S. dollars.

[3] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.

[4] The top eight monitor panel manufacturers by combined panel revenues for 1999-2006 are displayed separately in this exhibit.

[5] "Other Alleged Conspirators" is comprised of the remaining conspirator monitor panel manufacturers: Acer, ADI, BOE Hydis, Epson, Fujitsu, Hitachi, Mitsubishi, Panasonic, Sanyo, SVA NEC, TM Display, Toppoly, Toshiba, TPO, Quanta, and Unipac. Not all members of this group have large-area TFT-LCD monitor panel revenue in each year.

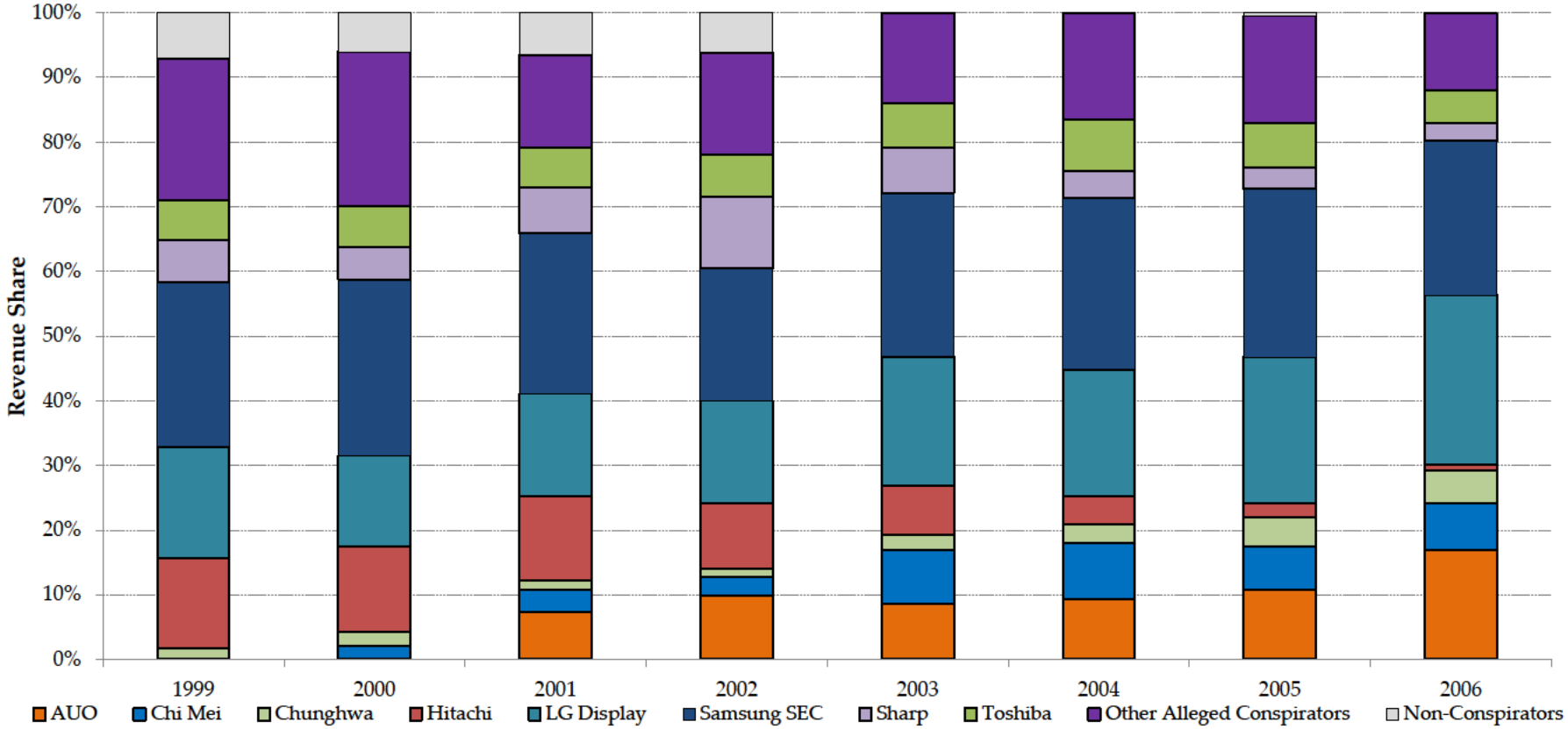
[6] "Non-Conspirators" is comprised of InfoVision, Philips Kobe, and Sony. Not all members of this group have large-area TFT-LCD monitor panel revenue in every year.

Sources:

[1] DisplaySearch Panel Shipments Data, DISP_LCD-000001.xlsx.

[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

Exhibit II.3
Revenue Shares of LCD Panel Manufacturers (Using DisplaySearch Data)
Large-area TFT-LCD Notebook Panel Sales
1999 - 2006[1]



Notes:

[1] DisplaySearch data for notebooks are available starting in the 4th quarter of 1999. Data exclude TFT-LCD panels that are less than 10 inches diagonally in size.

[2] Notebook panel revenue shares are based on worldwide sales expressed in U.S. dollars.

[3] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.

[4] The top eight notebook panel manufacturers by combined panel revenues for 1999-2006 are displayed separately in this exhibit.

[5] "Other Alleged Conspirators" is comprised of the remaining conspirator notebook manufacturers: Acer, ADI, BOE Hydis, Epson,Fujitsu, HannStar, NEC, Panasonic, Quanta, Sanyo, Toppoly, TPO, and Unipac. Not all members of this group have large-area TFT-LCD notebook panel revenue in each year.

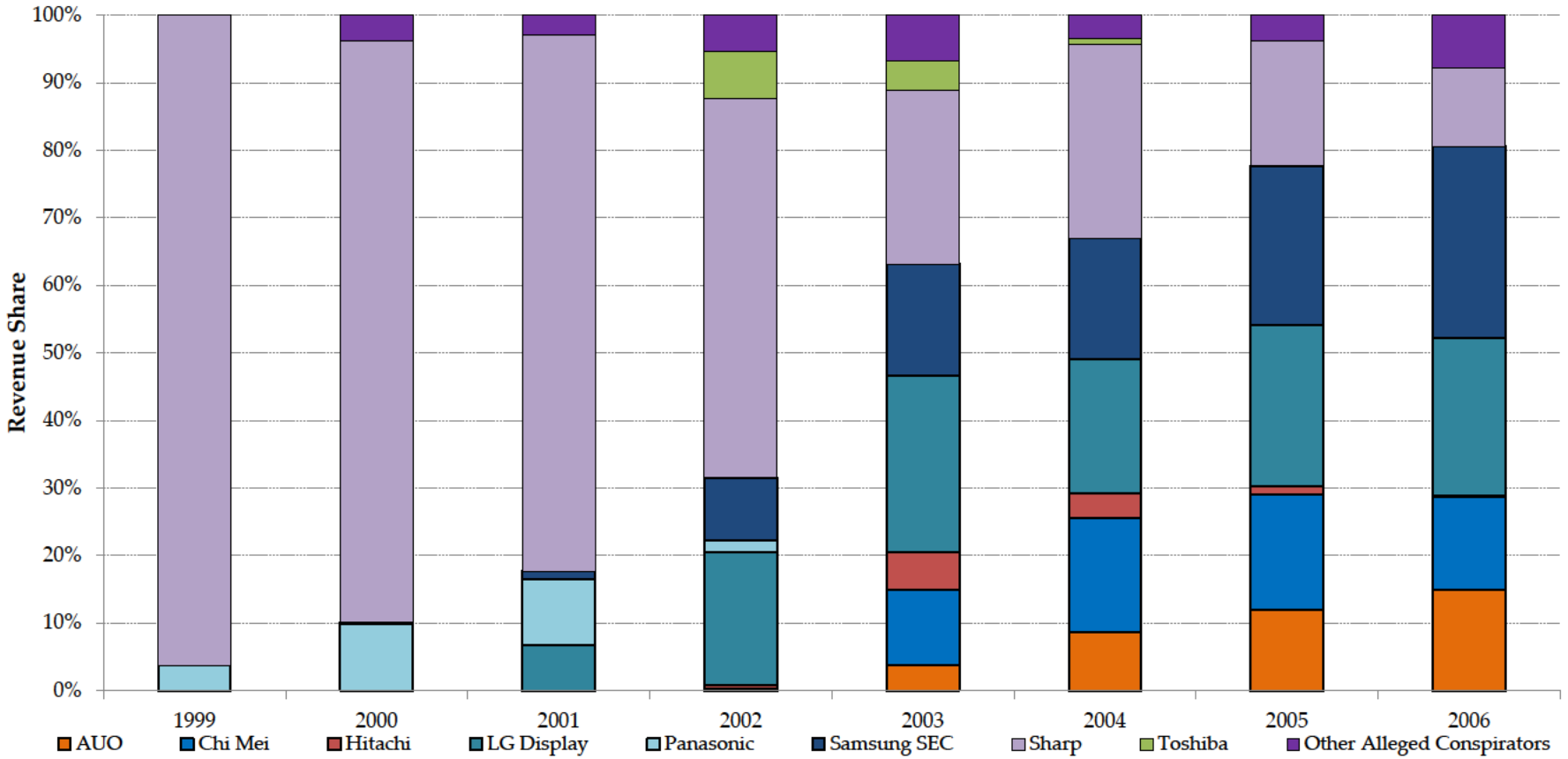
[6] "Non-Conspirators" is comprised of Sony. Sony does not have large-area TFT-LCD notebook panel revenue in every year.

Sources:

[1] DisplaySearch, DISP_LCD-000001.xlsx.

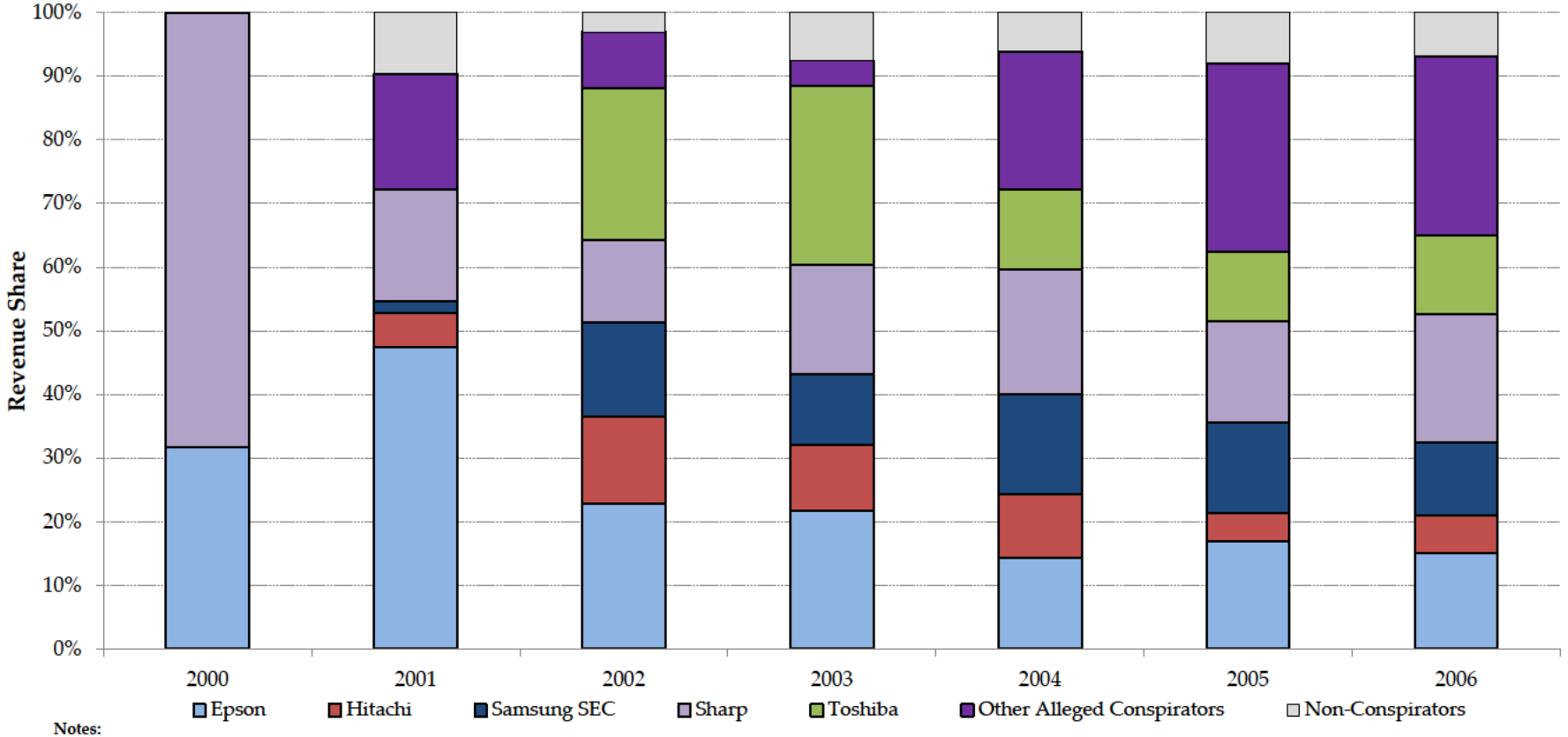
[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

Exhibit II.4
Revenue Shares of LCD Panel Manufacturers (Using DisplaySearch Data)
Large-area TFT-LCD Television Panel Sales
1999 - 2006[1]



Notes:
[1] DisplaySearch data for televisions are available starting in the 4th quarter of 1999. Data exclude TFT-LCD panels that are less than 10 inches diagonally in size.
[2] Television panel revenue shares are based on worldwide sales expressed in U.S. dollars.
[3] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.
[4] The top eight television panel manufacturers by combined panel revenues for 1999-2006 are displayed separately in this exhibit.
[5] "Other Alleged Conspirators" is comprised of the remaining conspirator television panel manufacturers: ADI, BOE Hydis, Chungwa, Epson, Fujitsu, HannStar, IPS Alpha, Mitsubishi, NEC, Quanta, Sanyo, and SVA NEC. Not all members of this group have large-area TFT-LCD television panel revenues in every year.
Sources:
[1] DisplaySearch Panel Shipments Data, DISP_LCD-000001.xlsx.
[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

Exhibit II.5
Revenue Shares of LCD Panel Manufacturers (Using DisplaySearch Data)
Small-area TFT-LCD Mobile Phone Panel Sales
2000 - 2006[1]



Notes:

[1] DisplaySearch data for mobile phones are available starting in 2000. Data exclude TFT-LCD panels that are greater than 10 inches diagonally in size.

[2] Mobile phone panel revenue shares are based on worldwide sales expressed in U.S. dollars. Data for mobile phones include the following categories: Mobile Phone and Mobile Phone Sub Display.

[3] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.

[4] The top five mobile phone panel manufacturers by combined panel revenues for 2000-2006 are displayed separately in this exhibit

[5] "Other Alleged Conspirators" is comprised of the remaining conspirator mobile phone panel manufacturers: Alps, AUO, BOE Hydis, LG Display, LG Innotek, Optrex, Philips, Samsung SDI, Sanyo, Seiko, Toppoly and TPO. Not all members of this group have small-area TFT-LCD mobile phone panel revenues in each year.

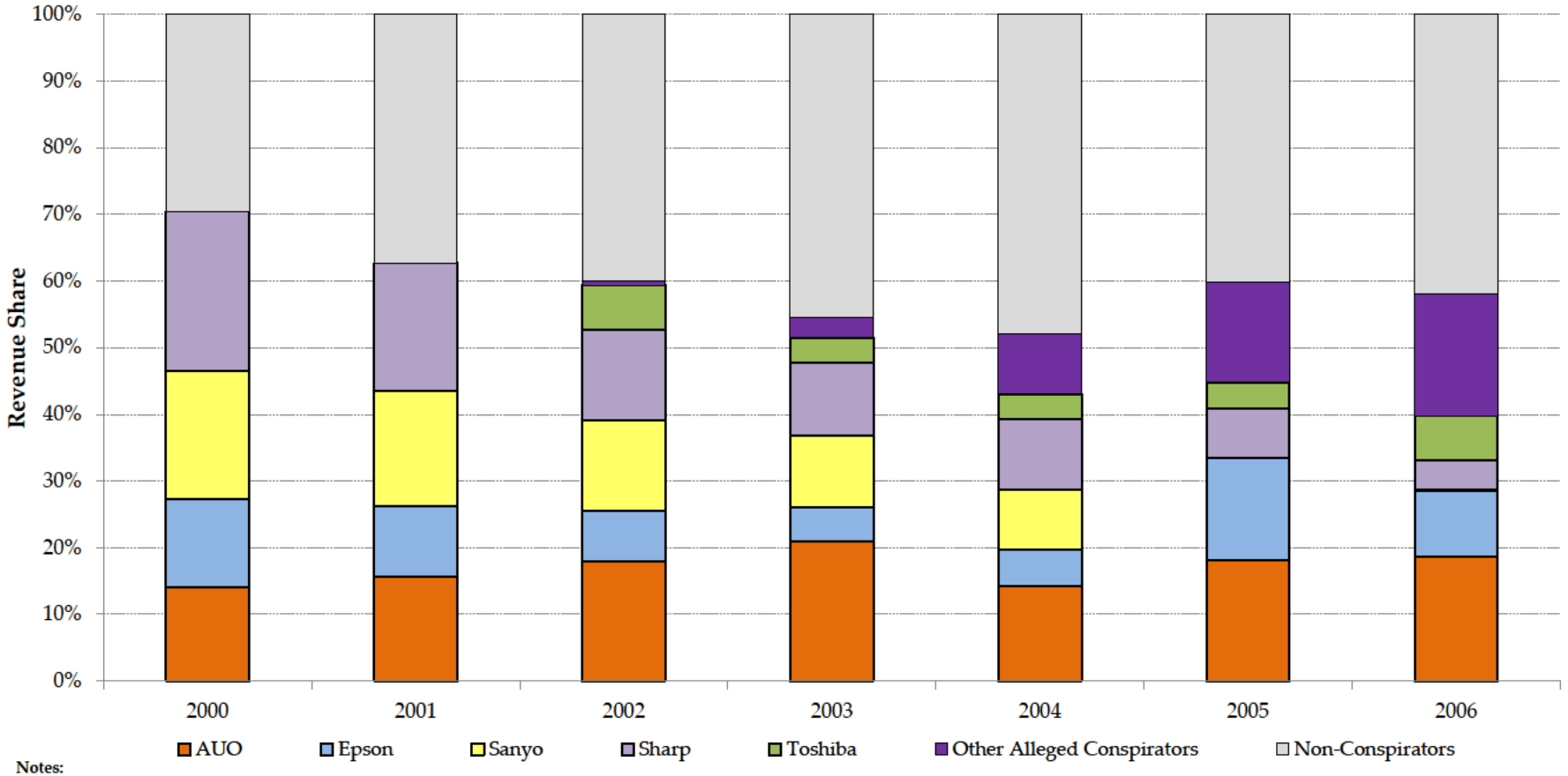
[6] "Non-Conspirators" is comprised of Casio, EDT, GiantPlus, Hyundai, Sony, ST-LCD, Wintek, and the "Others" group listed in DisplaySearch. Not all members of this group have large-area TFT-LCD television panel revenues in every year.

Sources:

[1] DisplaySearch Panel Shipments Data, DISP_LCD-000001.xlsx.

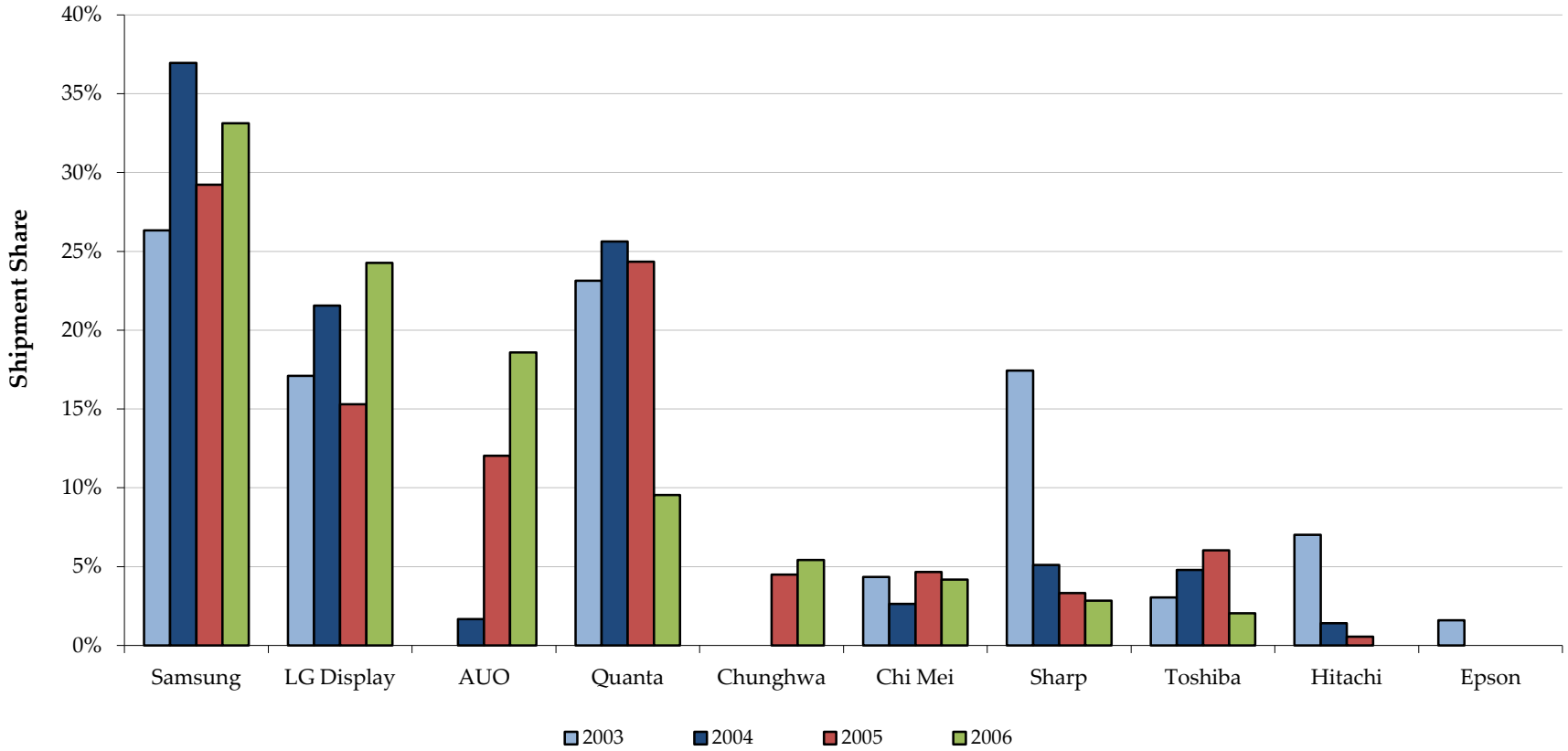
[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiff cases.

Exhibit II.6
Revenue Shares of LCD Panel Manufacturers (Using DisplaySearch Data)
Small-area TFT-LCD Digital Camera and Digital Camcorder Panel Sales
2000 - 2006[1]



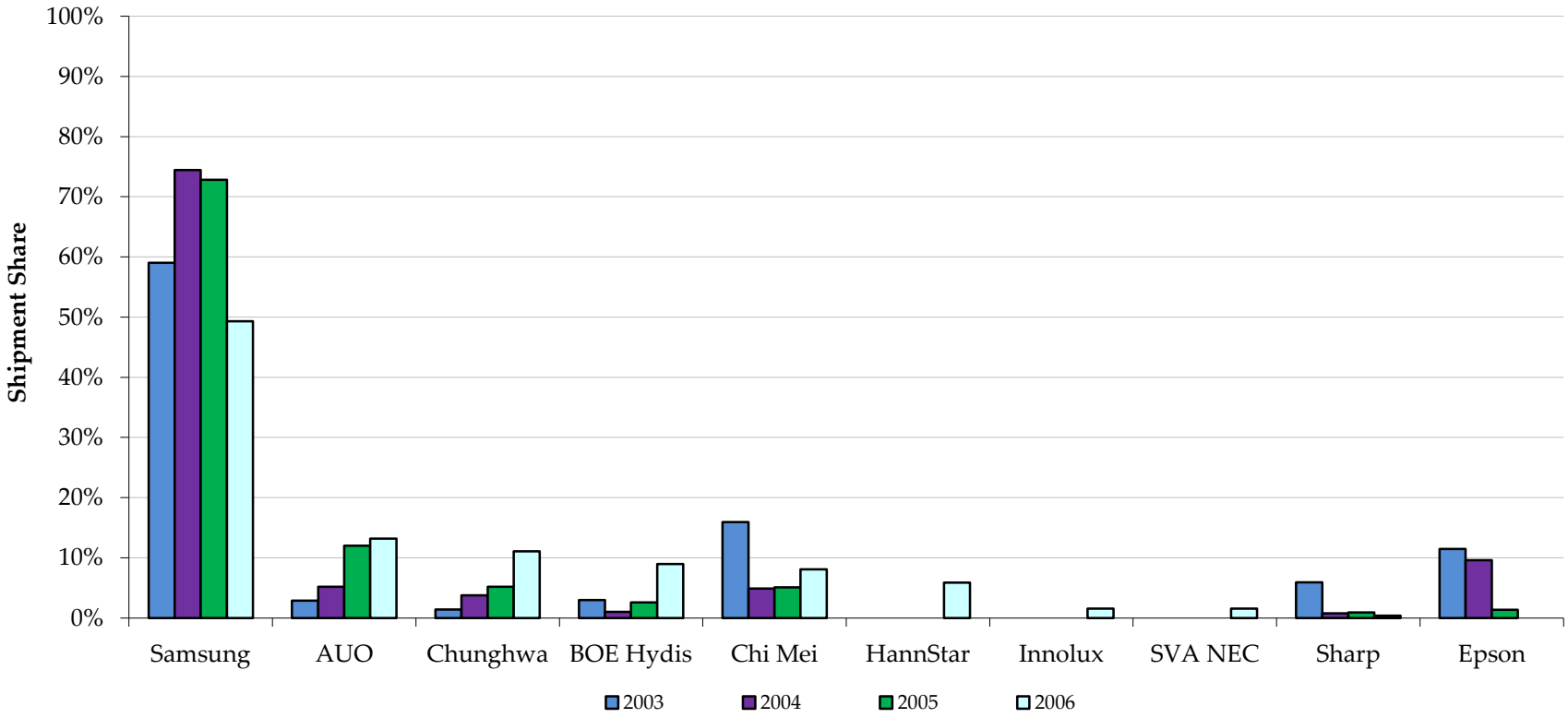
Notes:
[1] DisplaySearch data for digital cameras are available starting in 2000. Data exclude TFT-LCD panels that are greater than 10 inches diagonally in size.
[2] Digital camera panel revenue shares are based on worldwide sales expressed in U.S. dollars.
[3] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.
[4] The top five digital camera panel manufacturers by combined panel revenues for 2000-2006 are displayed separately in this exhibit
[5] "Other Alleged Conspirators" is comprised of the remaining conspirator digital camera panel manufacturers: Optrex, Toppoly, and TPO.
[6] "Non-Conspirators" is comprised of Casio, Sony, ST-LCD, and the "Others" category listed in DisplaySearch. Not all members of this group have small-area TFT-LCD digital camera panel revenues in every year.
Sources:
[1] DisplaySearch Panel Shipments Data, DISP_LCD-000001.xlsx.
[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

Exhibit II.7
Large-area TFT-LCD Notebook Panel Suppliers for Dell (Using DisplaySearch data)
2003 - 2006



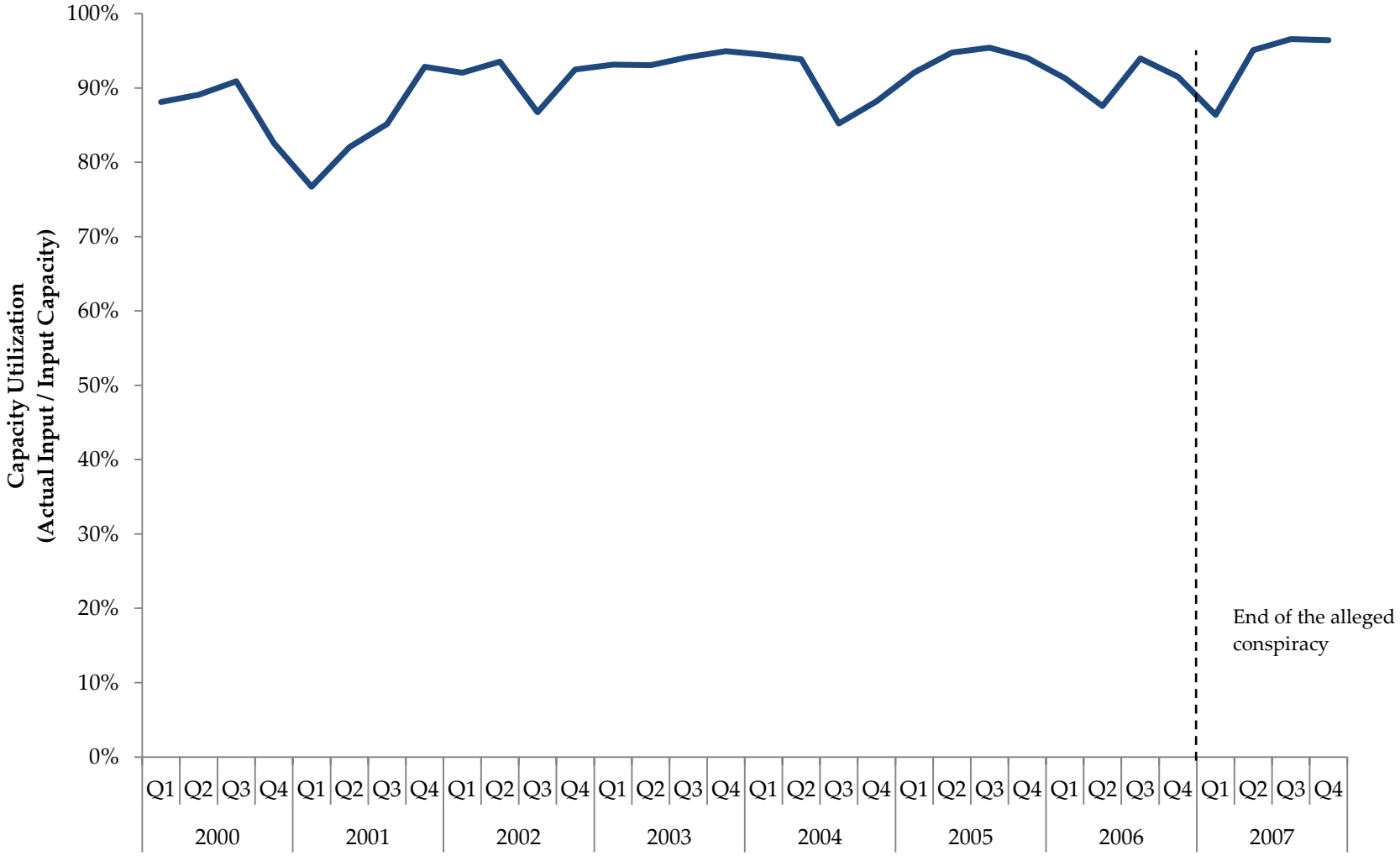
Notes:
[1] Shipment shares are based on worldwide panel shipments.
[2] Data exclude TFT-LCD panels that are less than 10 inches diagonally in size.
[3] Panel manufacturers are sorted in order of 2006 shipment share. Shipment shares are calculated as the share of the supplier of worldwide panels units included in Dell notebooks, according to DisplaySearch.
[4] Panel manufacturers that did not exceed a 1% shipment share in any year are excluded.
Source:
[1] DisplaySearch, SECm00093474-20070905_DS_ValueChain_PivotTables_Note_PC.xls.

Exhibit II.8
Large-area TFT-LCD Monitor Panel Suppliers for Samsung (Using DisplaySearch data)
2003 - 2006



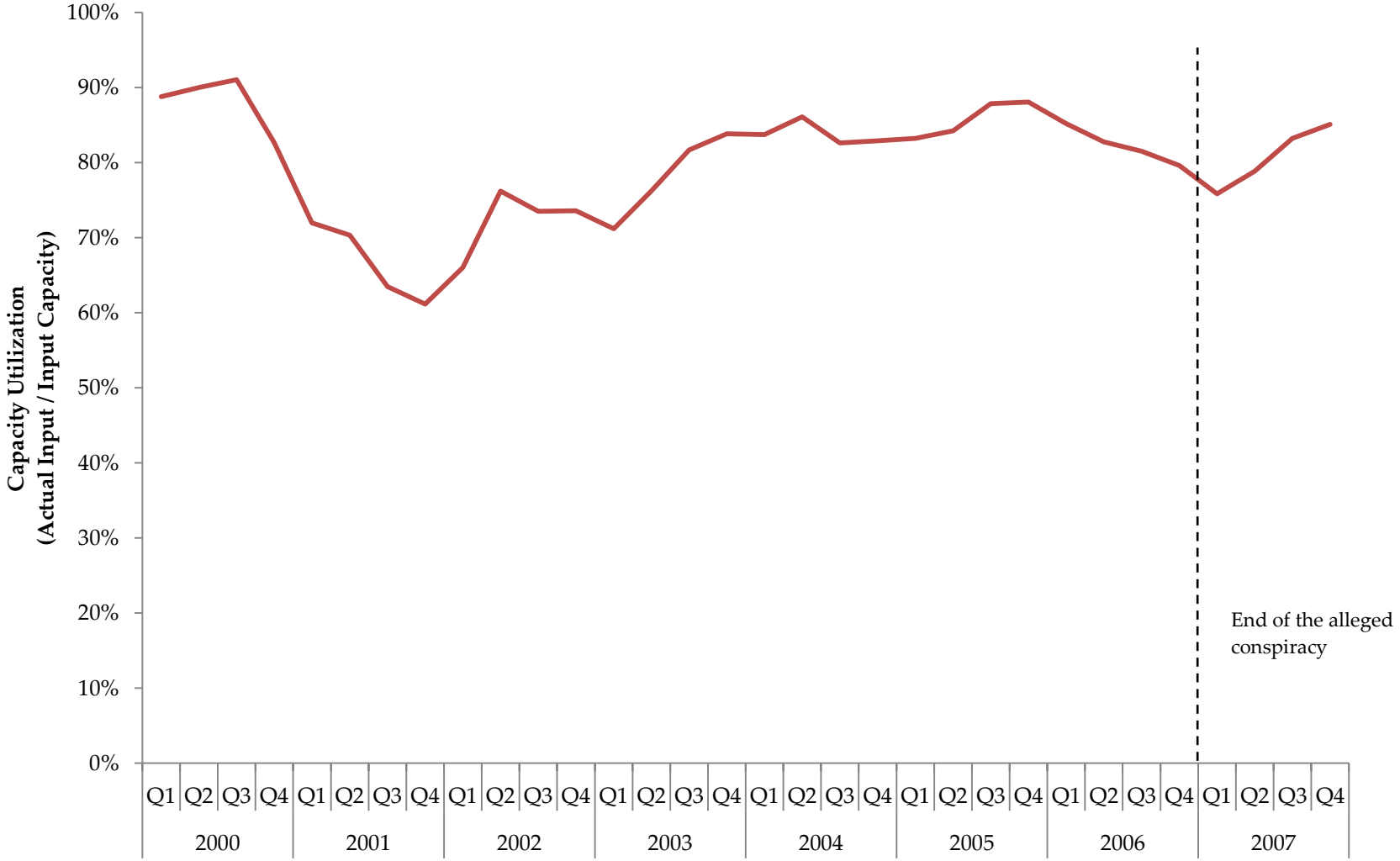
Notes:
[1] Shipment shares are based on worldwide panel shipments.
[2] Data exclude TFT-LCD panels that are less than 10 inches diagonally in size.
[3] Panel manufacturers are sorted in order of 2006 shipment share. Shipment shares are calculated as the share of the supplier of worldwide panel units included in Dell notebooks, according to DisplaySearch.
[4] Panel manufacturers that did not exceed a 1% shipment share in any year were excluded.
Source:
[1] DisplaySearch, LCD Monitor Value Chain Pivot Tables 2001 - 2006, SECm00093707.

Exhibit II.9
Capacity Utilization Rate for Large Panel Production (Using DisplaySearch Data)
2000 - 2007



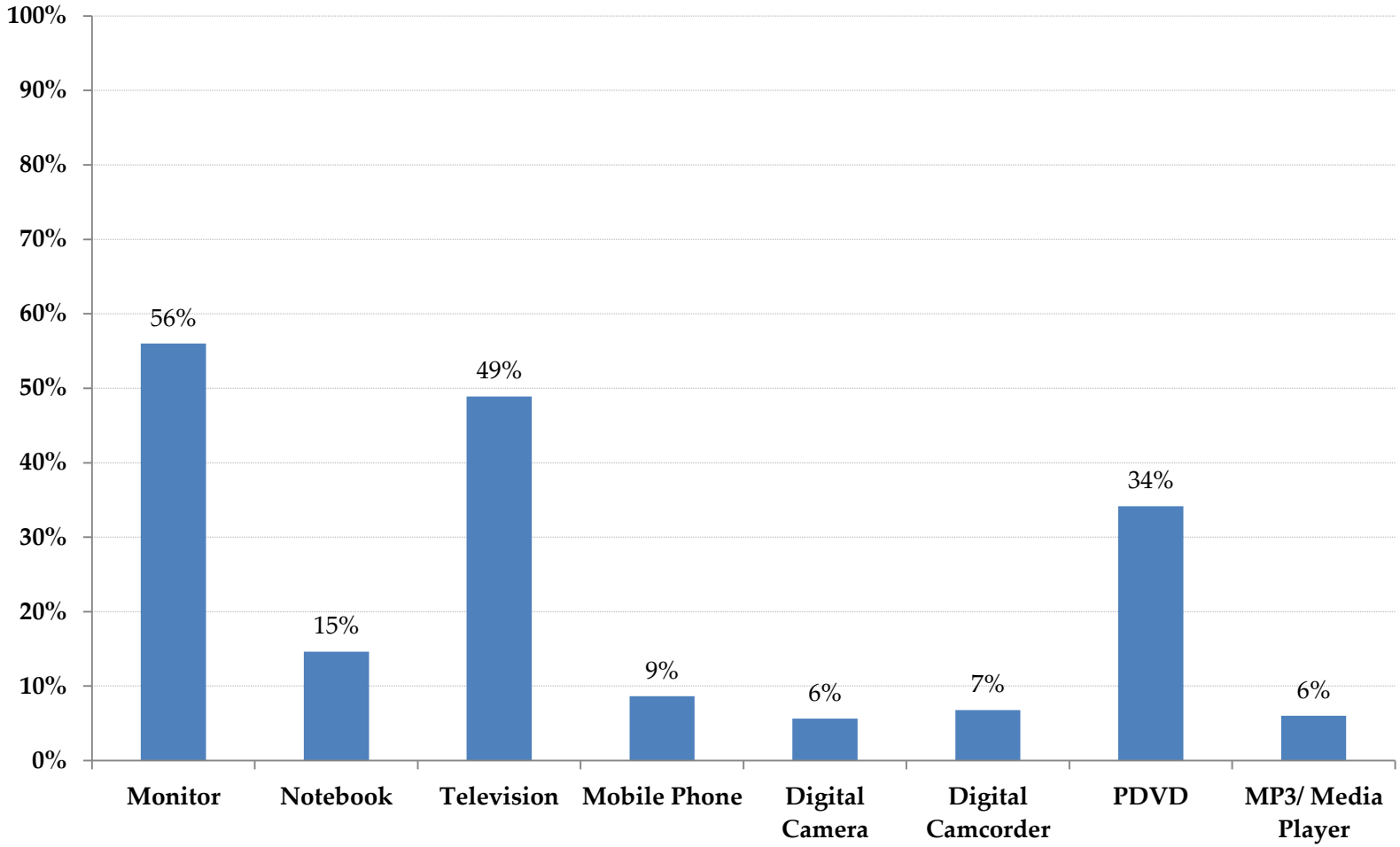
Source:
[1] DisplaySearch Quarterly FPD Supply/Demand & Capital Spending Report, DS_2011Q1_QSD.xlsx.

Exhibit II.10
Capacity Utilization Rate for Small Panel Production (Using DisplaySearch Data)
2000 - 2007



Source:
[1] DisplaySearch Quarterly FPD Supply/Demand & Capital Spending Report, DS_2011Q1_QSD.xlsx.

Exhibit II.11
LCD Panel Value as a Percentage of Finished Product Cost



Notes:
[1] Plaintiff data containing finished product purchases and alleged conspirator data containing finished product sales to the plaintiffs are used to calculate the dollar volume (cost) of finished LCD products for each product type on which the plaintiffs have brought claims. The value of the panels contained in these finished products is identified by matching the unit volume of these finished products with the median price of LCD panels, of a similar type and application, and time period, sold by the alleged conspirators.
[2] The dollar value of finished LCD products is used as the denominator and the dollar value of the associated LCD panels is used as the numerator to calculate the LCD panel value as a percentage of finished product cost for each product type.
Source:
[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., and Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.11.a
LCD Panel as Percent of Finished Product Value
Monitor

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
ABC Warehouse	4,716,672	3,393,726
BrandsMart	20,699,151	11,644,919
Circuit City	961,584,845	605,896,354
CompuCom	268,377,186	141,262,689
MARTA	8,516	2,122
Office Depot	337,433,732	200,917,044
PC Richard	24,034,900	13,245,661
Tech Data	2,343,359,986	1,241,705,523
Tweeter	201,249	66,733
Overall	**3,960,416,237**	**2,218,134,772**
Panel as Percent of Finished Product Value	**56%**	**[3] = [2]/[1]**

Notes:

[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market.

[2] Estimated panel dollar volume of commerce is calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Source:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.11.b
LCD Panel as Percent of Finished Product Value
Notebook

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
ABC Warehouse	4,432,654	766,677
BrandsMart	137,100,225	21,365,707
Circuit City	5,817,148,678	963,904,878
CompuCom	1,741,326,139	210,156,445
Office Depot	1,394,253,517	217,487,060
PC Richard	158,410,492	24,511,019
Tech Data	4,759,772,788	611,125,062
Overall	**14,012,444,493**	**2,049,316,848**
Panel as Percent of Finished Product Value	**15%**	**[3] = [2]/[1]**

Notes:

[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market.

[2] Estimated panel dollar volume of commerce is calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Source:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.11.c
LCD Panel as Percent of Finished Product Value
Television

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
ABC Warehouse	63,548,296	31,681,561
BrandsMart	257,323,018	128,858,971
Circuit City	2,204,484,987	1,090,441,642
CompuCom	116,139	54,098
MARTA	67,027,290	29,617,014
NECO	39,000,331	18,020,283
Office Depot	52,582,121	27,708,151
PC Richard	329,498,431	145,159,131
Syntax Brillian	293,520,979	162,055,325
Tech Data	16,036,529	7,949,737
Tweeter	225,823,747	93,919,835
Overall	**3,548,961,869**	**1,735,465,748**
Panel as Percent of Finished Product Value	**49%**	**[3] = [2]/[1]**

Notes:

[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market.

[2] Estimated panel dollar volume of commerce is calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Source:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.11.d
LCD Panel as Percent of Finished Product Value
Mobile Phone

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
CompuCom	724,838	57,494
MetroPCS	429,658,099	37,275,183
Tech Data	1,420,261	45,000
Overall	**431,803,198**	**37,377,678**
Panel as Percent of Finished Product Value	**9%**	**[3] = [2]/[1]**

Notes:

[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market. TracFone also purchased mobile phones, but the primary datasource relied upon by Prof. Blair to determine TracFone's purchases does not include information on the cost of these purchases. Consequently, Prof. Blair does not report an estimate of dollar volume of commerce.

[2] Estimated panel dollar volume of commerce for plaintiffs other than TracFone are calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Sources:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

[2] Backup Production to Declaration of Prof. Roger D. Blair, Ph.D., June 6, 2013.

Exhibit II.11.e
LCD Panel as Percent of Finished Product Value
Digital Camera

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
ABC Warehouse	15,123,778	840,662
BrandsMart	77,250,242	5,037,497
Circuit City	1,765,306,889	101,422,777
CompuCom	5,330,756	299,100
MARTA	28,721	6,909
NECO	77,222	3,769
Office Depot	123,455,376	7,584,799
PC Richard	67,304,439	3,739,152
Tech Data	480,836,932	23,914,082
Tweeter	8,057,422	323,151
Overall	**2,542,771,776**	**143,171,900**
Panel as Percent of Finished Product Value	**6%**	**[3] = [2]/[1]**

Notes:

[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market.

[2] Estimated panel dollar volume of commerce is calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Source:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.11.f
LCD Panel as Percent of Finished Product Value
Digital Camcorder

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
ABC Warehouse	32,591,538	2,850,156
BrandsMart	103,852,149	6,700,643
Circuit City	1,547,754,860	107,341,465
CompuCom	6,915	176
MARTA	2,368,387	162,052
NECO	421,715	18,380
Office Depot	2,200,769	83,017
PC Richard	116,198,231	7,426,438
Tech Data	20,942,733	569,941
Tweeter	52,087,747	2,415,268
Overall	**1,878,425,044**	**127,567,537**
Panel as Percent of Finished Product Value	**7%**	**[3] = [2]/[1]**

Notes:

[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market.

[2] Estimated panel dollar volume of commerce is calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Source:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.11.g
LCD Panel as Percent of Finished Product Value
Portable DVD Player

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
ABC Warehouse	6,090,824	1,964,830
BrandsMart	1,501,346	416,732
Circuit City	533,354,783	183,150,361
MARTA	441,093	148,570
NECO	139,913	41,321
Office Depot	719,044	153,235
PC Richard	15,697,654	4,929,906
Tech Data	435,004	17,843
Tweeter	3,238,828	969,499
Overall	**561,618,488**	**191,792,297**
Panel as Percent of Finished Product Value	**34%**	**[3] = [2]/[1]**

Notes:

[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market.

[2] Estimated panel dollar volume of commerce is calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Source:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.11.h
LCD Panel as Percent of Finished Product Value
MP3/Media Player

Plaintiff	[1] LCD Product Volume of Commerce ($)	[2] Estimated Panel Volume of Commerce ($)
ABC Warehouse	25,061	8,149
BrandsMart	835,908	94,224
Circuit City	9,146,333	852,545
PC Richard	5,953,443	310,932
Tech Data	65,536,940	3,698,897
Tweeter	5,185,976	256,246
Overall	**86,683,662**	**5,220,994**
Panel as Percent of Finished Product Value	**6%**	**[3] = [2]/[1]**

Notes:

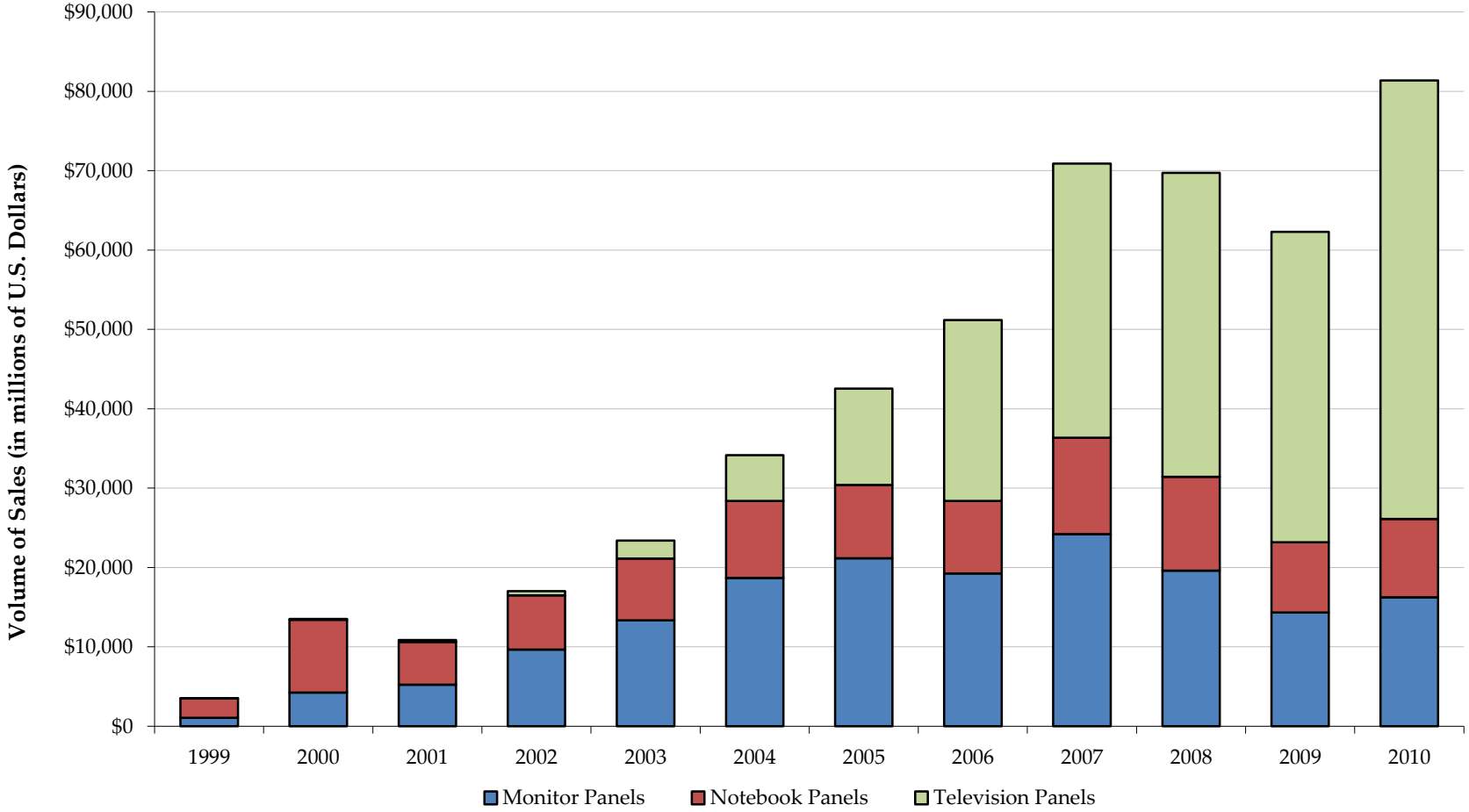
[1] Finished product dollar volume of commerce has been adjusted for the alleged conspirators' share of the LCD panel market.

[2] Estimated panel dollar volume of commerce is calculated by multiplying the number of units by the median panel price as calculated by Prof. Bernheim. This method accounts for variation in panel prices across panel sizes (a proxy for quality) and over time.

Source:

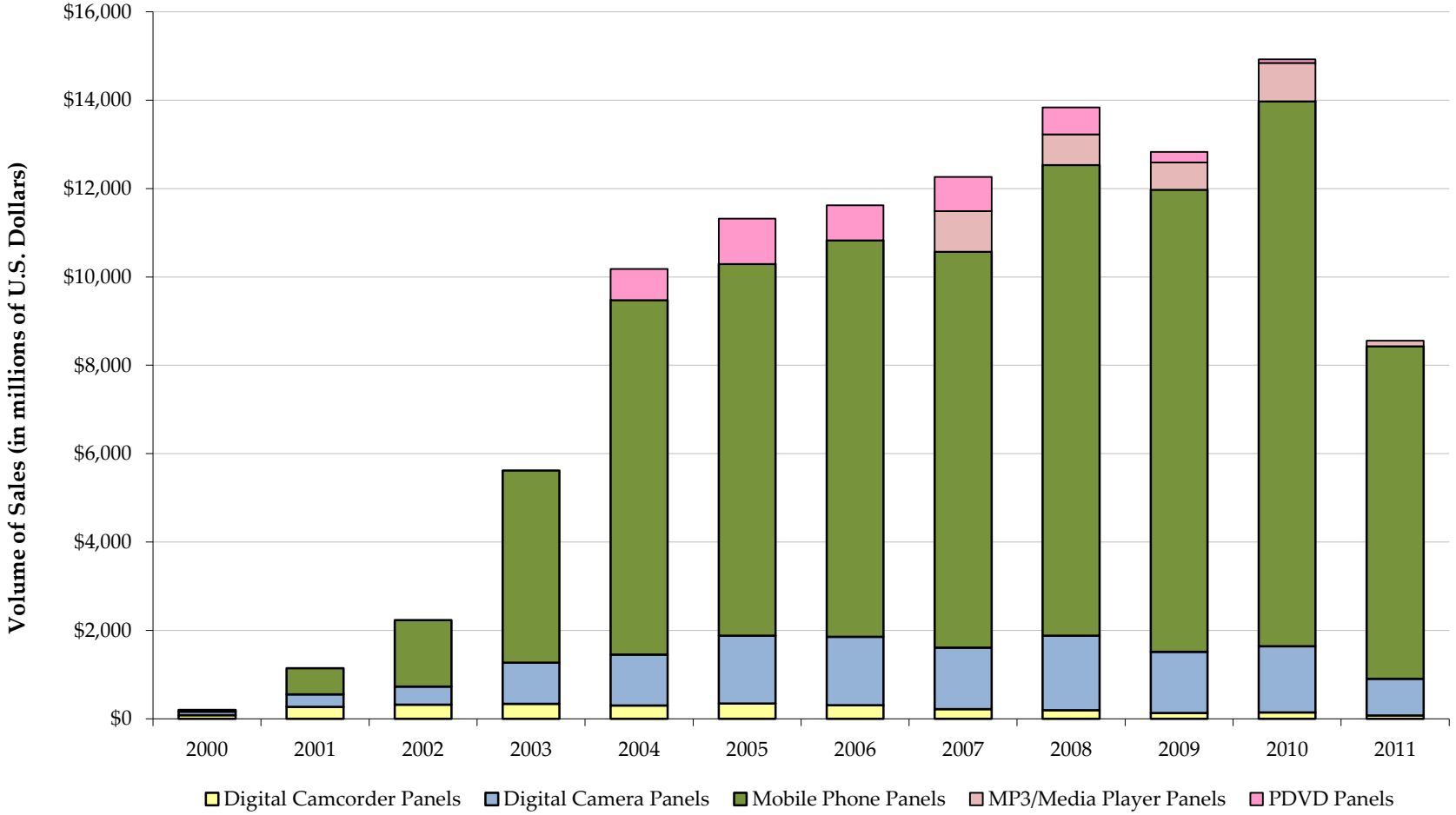
[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013.

Exhibit II.12
Worldwide Sales Volume by Large-area TFT-LCD Panel Type (Using DisplaySearch Data)
1999 - 2010



Notes:
[1] Data exclude TFT-LCD panels that are less than 10 inches diagonally in size.
[2] For year 1999, DisplaySearch Panel Shippments Data contain sales volume information only for the fourth quarter.
Source:
[1] DisplaySearch Panel Shipments Data, DISP_LCD-000001.xls.

Exhibit II.13
Worldwide Sales Volume by Small-area TFT-LCD Panel Type (Using DisplaySearch Data)
2000 - 2011



Note:
[1] Data exclude TFT-LCD panels that are 10 inches or greater diagonally in size.
Source:
[1] DisplaySearch Panel Shipments Data, DISP_LCD-000001.xls.

Exhibit III.1
Direct and Indirect Damages in U.S. Dollars

Plaintiff	Conspiracy Period			Plea Period		
	Direct	Indirect	Total	Direct	Indirect	Total
ABC Warehouse	113,841	2,874	116,715	89,452	2,629	92,081
All American	2,068,017		2,068,017	1,713,586		1,713,586
BrandsMart	460,010	12,740	472,750	420,423	9,134	429,557
Circuit City	5,279,578	46,926	5,326,505	4,429,712	35,784	4,465,496
CompuCom	576,936	131,103	708,039	215,798	81,008	296,806
Jaco	1,057,422		1,057,422	557,071		557,071
MARTA	116,528	6	116,535	115,869	6	115,875
MetroPCS	110,200	144,307	254,507	110,200	144,307	254,507
NECO	73,287		73,287	73,138		73,138
Office Depot	664,792	247,747	912,540	630,192	229,204	859,396
P.C. Richard	499,101	20,592	519,693	434,866	16,050	450,915
Syntax Brillian		0	0		0	0
Tech Data	3,193,282	2,286	3,195,567	2,069,862	1,935	2,071,797
TracFone	20,618	473,411	494,029	20,618	450,395	471,013
Tweeter	217,740	1,772	219,512	208,493	1,766	210,259
Total	**14,451,353**	**1,083,764**	**15,535,118**	**11,089,280**	**972,217**	**12,061,498**

Notes:

[1] See Appendix D for a detailed description of the steps used to calculate volume of commerce and damages.

[2] In summary, damages are estimated in three steps:

Step 1: Estimate volume of commerce;

Step 2: Multiply the volume of commerce estimate by Dr. Carlton's panel overcharge estimate;

Step 3: For indirect purchases, multiply the dollar figure from Step 2 by the estimate of pass-through to the plaintiff and one minus the estimate of pass-through by the plaintiff.

[3] Blank spaces in the table indicate that the plaintiff did not bring direct or indirect claims. Zero values in the table indicate that damages are $0.

Sources:

[1] Backup Production to Expert Reports of Professors B. Douglas Bernheim, Ph.D., and Leslie M. Marx, Ph.D., and Dr. Karl N. Snow, Ph.D., June 13, 2013; Backup Production to Declaration of Prof. Roger D. Blair, June 6, 2013.

[2] Expert Report of Prof. Dennis Carlton, Ph.D., October 29, 2013.

Exhibit V.1
Relationship Between LCD Product Manufacturer Cost, Price, and Quantity Transacted

Application	Regression of Price on Cost Controlling for Fixed Differences Between Products[1]		Regression of Quantity Transacted on Cost Controlling for Fixed Differences Between Products[2]		Regression of Price on Cost Controlling for Fixed Differences Between Products and Time-on-Market[3]		Regression of Quantity Transacted on Cost Controlling for Fixed Differences Between Products and Time-on-Market[4]	
	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
Digital Camcorders	1.01	0.21	9.10	4.95	0.90	0.21	-7.72	2.99
Digital Cameras	1.05	0.28	13.33	8.39	1.03	0.31	-13.28	5.74
Mobile Phones	1.10	0.00	-0.18	0.23	1.10	0.00	-0.58	0.29
Monitors	1.27	0.11	0.10	0.05	1.23	0.12	-0.97	0.25
Notebooks	0.97	0.02	-0.01	0.00	0.96	0.02	-0.03	0.00
Televisions	1.14	0.05	2.65	0.64	1.02	0.05	0.57	0.67

Notes:

[1] $Price_{it} = \lambda + \phi * Cost_{it} + \delta_i + \omega_{it}$,
where δ_i is the product fixed effect and ω_{it} is the error term. The estimated coefficient (ϕ) is reported in the first column above. Its sign is the same as the sign of the partial correlation between price and cost controlling for fixed differences between products.

[2] $Quantity_{it} = \alpha + \beta * Cost_{it} + \delta_i + \mu_{it}$,
where δ_i is the product fixed effect and μ_{it} is the error term. The estimated coefficient (β) is reported in the second column above. Its sign is the same as the sign of the partial correlation between cost and quantity transacted controlling for fixed differences between products.

[3] $Price_{it} = \lambda + \phi * Cost_{it} + \delta_i + \tau_t + \omega_{it}$,
where δ_i is the product fixed effect, τ_t is the time-on-market fixed effect, and ω_{it} is the error term. The estimated coefficient (ϕ) is reported in the third column above. Its sign is the same as the partial correlation between price and cost controlling for fixed differences between products and time-on-market.

[4] $Quantity_{it} = \alpha + \beta * Cost_{it} + \delta_i + \tau_t + \mu_{it}$,
where δ_i is the product fixed effect, τ_t is the time-on-market fixed effect, and μ_{it} is the error term. The estimated coefficient (β) is reported in the fourth column above. Its sign is the same as the partial correlation between cost and quantity transacted controlling for fixed differences between products and time-on-market.

Sources:

[1] Transaction data provided by third parties.

[2] Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph.D., June 13, 2013.

Exhibit V.2
Comparison of Residual Variation in LCD Product Manufacturer Cost

Equation	Digital Camcorders	Digital Cameras	Mobile Phones	Monitors	Notebooks	Televisions
[A] Equation 2 (Price regressed on cost and product fixed effect)	470	314	202	935	14,966	6,988
[B] Equation 3 (Price regressed on cost, product fixed effect, and time-on-market fixed effect)	298	170	142	789	13,629	4,368
[C] Equation 5 (Price regressed on cost, product fixed effect, and product-specific time-on-market trend)	121	84	96	376	11,059	1,119

Notes:

[1] Finished product manufacturers include Acer, AOpen Dell, Envision, Funai, Lenovo, Motorola, Sony, Motorola and Westinghouse.

[2] The residual variation of a variable is calculated as the variance of the residual obtained by regressing cost on the other controls included in the specification.

[3] Adding a control for the product life cycle reduces the residual variation in cost. The effect on attenuation depends on the magnitude of the reduction in residual variation in cost. The time-on-market fixed effects reduce residual variation in cost less than the product-specific time-on-market trends.

Sources:

[1] Transaction data provided by third parties.

[2] Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph.D., June 13, 2013.

Exhibit VI.1
Share of Alleged Conspirator and Alleged Affiliate Branded LCD Finished Products[1]
Assembled by Third-Party Assemblers (in Thousands of Units)
(Using DisplaySearch Data)
2001 - 2006

	[A]	[B]	[C]=[A]+[B]	[D]=[B]/[C]
Application	**Units Assembled by Alleged Conspirator/Alleged Affiliate Assemblers**	**Units Assembled by Third-Party Assemblers**	**Total Units**	**Share of Alleged Conspirator/Alleged Affiliate Branded LCD Finished Products Assembled by Third-Party Assemblers**
Monitor[2]	112,071	48,777	160,847	30%
Notebook[3]	61,308	41,440	102,748	40%
TV[4]	42,248	5,124	47,371	11%
Total	**215,627**	**95,340**	**310,967**	**31%**

Notes:

[1] Alleged conspirators and alleged affiliates are identified according to the plaintiffs complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.
Alleged conspirator and alleged affiliate brands are identified using the plaintiffs complaints and interrogatories.
Alleged conspirator and alleged affiliate assemblers are defined as LCD product assemblers who are identified as alleged conspirator or alleged affiliate according to the plaintiffs complaints and interrogatories.
Third-party assemblers are defined as LCD product assemblers who are not identified as alleged conspirator or alleged affiliate according to the plaintiffs complaints and interrogatories.
See Exhibits VI.1.a - VI.1.c for the breakdown of shares by alleged conspirator/alleged affiliate brand for each product type.

[2] DisplaySearch Value Chain data for monitors are available for 2001-2006.

[3] DisplaySearch Value Chain data for notebooks are available for 2001-2006.

[4] DisplaySearch Value Chain data for TVs are available for 2004-2006.

Sources:

[1] DisplaySearch Value Chain Data, SECm00093707-20070905_DS_ValueChain_PivotTables_Monitor.xlsx.

[2] DisplaySearch Value Chain Data, SECm00093474-20070905_DS_ValueChain_PivotTables_Note_PC.xlsx.

[3] DisplaySearch Value Chain Data, SECm00093311-20070905_DS_ValueChain_PivotTables_LCD_TV.xlsx.

[4] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

Exhibit VI.1.a
Share of Alleged Conspirator and Alleged Affiliate Branded LCD Finished Products[1]
Assembled by Third-Party Assemblers (in Thousands of Units)
(Using DisplaySearch Data)
2001 - 2006
Monitor

Alleged Conspirator/ Alleged Affiliate Brand	LCD Product Assembler	2001	2002	2003	2004	2005	2006	Total Units	Share of Brand Total
ACER	Alleged Conspirator/Alleged Affiliate			563	819	1,626	1,364	4,373	18.6%
	Third Party			1,297	2,432	6,263	9,112	19,104	81.4%
	Total			**1,860**	**3,251**	**7,889**	**10,476**	**23,477**	**100.0%**
BENQ	Alleged Conspirator/Alleged Affiliate	243	600	1,341	2,507	3,680	4,649	13,020	99.7%
	Third Party		33					33	0.3%
	Total	**243**	**633**	**1,341**	**2,507**	**3,680**	**4,649**	**13,053**	**100.0%**
CMV[2]	Alleged Conspirator/Alleged Affiliate				996	1,380	1,515	3,891	87.0%
	Third Party				6		576	582	13.0%
	Total				**1,002**	**1,380**	**2,091**	**4,472**	**100.0%**
FUJITSU	Alleged Conspirator/Alleged Affiliate		151					151	100.0%
	Third Party							0	0.0%
	Total		**151**					**151**	**100.0%**
FUJITSU LIMITED	Alleged Conspirator/Alleged Affiliate	639	542	554	684	381	2	2,803	46.0%
	Third Party			295	156	396	2,438	3,285	54.0%
	Total	**639**	**542**	**849**	**840**	**777**	**2,439**	**6,088**	**100.0%**
HANNSG[3]	Alleged Conspirator/Alleged Affiliate							0	0.0%
	Third Party						2,226	2,226	100.0%
	Total						**2,226**	**2,226**	**100.0%**
HITACHI	Alleged Conspirator/Alleged Affiliate	245	354	226	449	153		1,427	60.9%
	Third Party	33	210	353	136	99	84	915	39.1%
	Total	**278**	**564**	**580**	**585**	**252**	**84**	**2,341**	**100.0%**
IBM	Alleged Conspirator/Alleged Affiliate	412	509	889	714	134		2,657	57.9%
	Third Party	119	237	353	931	294		1,934	42.1%
	Total	**531**	**746**	**1,241**	**1,645**	**428**		**4,591**	**100.0%**
LGE	Alleged Conspirator/Alleged Affiliate	469	1,009	1,928	3,610	6,026	7,600	20,643	95.0%
	Third Party		149	229		130	576	1,083	5.0%
	Total	**469**	**1,158**	**2,157**	**3,610**	**6,156**	**8,176**	**21,726**	**100.0%**
MELCO[4]	Alleged Conspirator/Alleged Affiliate		9	52	15			76	11.0%
	Third Party	83	138	191	198	4		613	89.0%
	Total	**83**	**147**	**243**	**213**	**4**		**689**	**100.0%**
MITSUBISHI	Alleged Conspirator/Alleged Affiliate					2		2	0.2%
	Third Party					529	686	1,216	99.8%
	Total					**531**	**686**	**1,218**	**100.0%**
NEC	Alleged Conspirator/Alleged Affiliate	664	537	618	682	63		2,565	80.0%
	Third Party		188	154	122	175		640	20.0%
	Total	**664**	**726**	**772**	**804**	**238**		**3,205**	**100.0%**
NEC DS	Alleged Conspirator/Alleged Affiliate					755	863	1,618	50.9%
	Third Party						1,562	1,562	49.1%
	Total					**755**	**2,426**	**3,181**	**100.0%**
NEC PC	Alleged Conspirator/Alleged Affiliate					244	192	436	19.7%
	Third Party					1,358	417	1,776	80.3%
	Total					**1,603**	**609**	**2,212**	**100.0%**
NEC-MITSUBISHI	Alleged Conspirator/Alleged Affiliate	351	351	904	1,090	697		3,393	39.8%
	Third Party	774	974	1,756	1,621	2		5,127	60.2%
	Total	**1,125**	**1,325**	**2,660**	**2,712**	**699**		**8,520**	**100.0%**

Exhibit VI.1.a
Share of Alleged Conspirator and Alleged Affiliate Branded LCD Finished Products[1]
Assembled by Third-Party Assemblers (in Thousands of Units)
(Using DisplaySearch Data)
2001 - 2006
Monitor

Alleged Conspirator/ Alleged Affiliate Brand	LCD Product Assembler	2001	2002	2003	2004	2005	2006	Total Units	Share of Brand Total
PANASONIC	Alleged Conspirator/Alleged Affiliate	11						11	12.2%
	Third Party	76						76	87.8%
	Total	**86**						**86**	**100.0%**
PHILIPS	Alleged Conspirator/Alleged Affiliate	545	1,125	1,807	2,551	4,458		10,486	68.6%
	Third Party			63	21		4,720	4,804	31.4%
	Total	**545**	**1,125**	**1,870**	**2,572**	**4,458**	**4,720**	**15,290**	**100.0%**
SAMSUNG	Alleged Conspirator/Alleged Affiliate	1,213	2,769	4,596	6,912	11,255	15,891	42,637	98.2%
	Third Party						761	761	1.8%
	Total	**1,213**	**2,769**	**4,596**	**6,912**	**11,255**	**16,653**	**43,398**	**100.0%**
SHARP	Alleged Conspirator/Alleged Affiliate	282	296	524	444	337		1,884	40.4%
	Third Party	93	400	430	544	739	568	2,774	59.6%
	Total	**375**	**696**	**954**	**988**	**1,077**	**568**	**4,657**	**100.0%**
TOSHIBA	Alleged Conspirator/Alleged Affiliate							0	0.0%
	Third Party	91	69	108				268	100.0%
	Total	**91**	**69**	**108**				**268**	**100.0%**
Alleged Conspirator/Alleged Affiliate Total		5,072	8,254	14,001	21,474	31,193	32,077	112,071	69.7%
Third-Party Total		1,268	2,397	5,229	6,166	9,990	23,726	48,777	30.3%
Grand Total		**6,341**	**10,651**	**19,230**	**27,640**	**41,183**	**55,803**	**160,847**	**100.0%**

Notes:

[1] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.
Alleged conspirator and alleged affiliate brands are identified using the plaintiffs' complaints and interrogatories.
Alleged conspirator and alleged affiliate assemblers are defined as LCD product assemblers who are identified as alleged conspirator or alleged affiliate according to the plaintiffs' complaints and interrogatories.
Third-party assemblers are defined as LCD product assemblers who are not identified as alleged conspirator or alleged affiliate according to the plaintiffs' complaints and interrogatories.

[2] "CMV" is identified as an alleged conspirator/alleged affiliate brand because CMV is a monitor brand of Chi Mei, an entity classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

[3] "HannsG" is identified as an alleged conspirator/alleged affiliate brand because HannsG is a monitor brand of Hannspree, an entity classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

[4] "MELCO" is identified as an alleged conspirator/alleged affiliate brand because Mitsubishi Electric Corp. is an entity classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

Sources:

[1] DisplaySearch Value Chain Data, SECm00093707-20070905_DS_ValueChain_PivotTables_Monitor.xlsx.

[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

[3] "Chi Mei Product," *Chimei.com* , http://www.chimei.com.tw/en/series.asp?Series 19, visited on October 18, 2013.

[4] "HannsG Contact," *Hannsg.com* , http://www.hannsg.com/US/EN/ContactUs.aspx, visited on October 18, 2013.

[5] "Reply to Notice of Nonconformance No. 99901410/2011-202," Pdadupws.nrc.gov, http://pbadupws.nrc.gov/docs/ML1205/ML12058A439.pdf, visited on October 23, 2013.

Exhibit VI.1.b
Share of Alleged Conspirator and Alleged Affiliate Branded LCD Finished Products[1]
Assembled by Third-Party Assemblers (in Thousands of Units)
(Using DisplaySearch Data)
2001 - 2006
Notebook

Alleged Conspirator/ Alleged Affiliate Brand	LCD Product Assembler	2001	2002	2003	2004	2005	2006	Total Units	Share of Brand Total
ACER	Alleged Conspirator/Alleged Affiliate	561	246	715	1,493	3,148	3,413	9,576	44.5%
	Third Party		647	1,331	1,667	2,666	5,628	11,938	55.5%
	Total	**561**	**893**	**2,046**	**3,160**	**5,814**	**9,041**	**21,514**	**100.0%**
FUJITSU	Alleged Conspirator/Alleged Affiliate	1,493	1,661	1,523	2,031			6,708	73.5%
	Third Party	141	306	912	1,055			2,414	26.5%
	Total	**1,634**	**1,967**	**2,435**	**3,086**			**9,122**	**100.0%**
HITACHI	Alleged Conspirator/Alleged Affiliate	147						147	8.4%
	Third Party	105	273	285	402	241	304	1,610	91.6%
	Total	**252**	**273**	**285**	**402**	**241**	**304**	**1,757**	**100.0%**
IBM	Alleged Conspirator/Alleged Affiliate	2,963	2,270	3,395	4,096	2,649		15,372	88.6%
	Third Party	168	489	169	300	846		1,972	11.4%
	Total	**3,131**	**2,759**	**3,564**	**4,396**	**3,495**		**17,344**	**100.0%**
NEC	Alleged Conspirator/Alleged Affiliate	782	1,130	1,295	967	1,203	1,304	6,679	58.2%
	Third Party	321	587	765	1,147	1,158	829	4,807	41.8%
	Total	**1,103**	**1,716**	**2,060**	**2,114**	**2,360**	**2,133**	**11,486**	**100.0%**
NEC/PACKARD BELL[2]	Alleged Conspirator/Alleged Affiliate	320						320	82.9%
	Third Party	66						66	17.1%
	Total	**386**						**386**	**100.0%**
PANASONIC	Alleged Conspirator/Alleged Affiliate	200	141	335	525	563		1,763	70.4%
	Third Party	24	99				618	741	29.6%
	Total	**224**	**240**	**335**	**525**	**563**	**618**	**2,503**	**100.0%**
SAMSUNG	Alleged Conspirator/Alleged Affiliate	285	194	384	378	695	755	2,690	83.7%
	Third Party		30	135	195	119	44	523	16.3%
	Total	**285**	**224**	**519**	**573**	**814**	**799**	**3,213**	**100.0%**
SHARP	Alleged Conspirator/Alleged Affiliate	83		48	120	18		269	9.4%
	Third Party	353	503	585	681	289	189	2,599	90.6%
	Total	**435**	**503**	**633**	**801**	**307**	**189**	**2,868**	**100.0%**
TOSHIBA	Alleged Conspirator/Alleged Affiliate	2,636	2,728	3,006	3,295	2,979	3,141	17,785	54.6%
	Third Party	417	935	1,737	2,415	3,906	5,362	14,771	45.4%
	Total	**3,053**	**3,662**	**4,743**	**5,710**	**6,885**	**8,503**	**32,556**	**100.0%**
Alleged Conspirator/Alleged Affiliate Total		9,467	8,369	10,701	12,905	11,253	8,613	61,308	59.7%
Third-Party Total		1,595	3,867	5,919	7,861	9,225	12,973	41,440	40.3%
Grand Total		**11,062**	**12,236**	**16,619**	**20,767**	**20,478**	**21,587**	**102,748**	**100.0%**

Notes:

[1] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.
Alleged conspirator and alleged affiliate brands are identified using the plaintiffs' complaints and interrogatories.
Alleged conspirator and alleged affiliate assemblers are defined as LCD product assemblers who are identified as alleged conspirator or alleged affiliate according to the plaintiffs' complaints and interrogatories.
Third-party assemblers are defined as LCD product assemblers who are not identified as alleged conspirator or alleged affiliate according to the plaintiffs' complaints and interrogatories.

[2] "NEC/Packard Bell" is identified as an alleged conspirator/alleged affiliate brand because Packard Bell NEC, Inc. is classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

Sources:

[1] DisplaySearch Value Chain Data, SECm00093474-20070905_DS_ValueChain_PivotTables_Note_PC.xlsx.
[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.
[3] "Agreement Concluded between Packard Bell and NEC on Merger of Worldwide PC Operations," *Nec.co.jp* , http://www.nec.co.jp/press/en/9607/1501.html, visited on October 24, 2013.

Exhibit VI.1.c
Share of Alleged Conspirator and Alleged Affiliate Branded LCD Finished Products[1]
Assembled by Third-Party Assemblers (in Thousands of Units)
(Using DisplaySearch Data)
2004 - 2006
Television

Alleged Conspirator/ Alleged Affiliate Brand	LCD Product Assembler	2004	2005	2006	Total Units	Share of Brand Total
ACER	Alleged Conspirator/Alleged Affiliate			65	65	100.0%
	Third Party				0	0.0%
	Total			**65**	**65**	**100.0%**
BENQ	Alleged Conspirator/Alleged Affiliate	78	107	141	326	100.0%
	Third Party				0	0.0%
	Total	**78**	**107**	**141**	**326**	**100.0%**
HANNSPREE[2]	Alleged Conspirator/Alleged Affiliate				0	0.0%
	Third Party			30	30	100.0%
	Total			**30**	**30**	**100.0%**
HITACHI	Alleged Conspirator/Alleged Affiliate	15	80	314	409	60.8%
	Third Party	94	86	83	264	39.2%
	Total	**109**	**166**	**398**	**673**	**100.0%**
JVC	Alleged Conspirator/Alleged Affiliate	188	327	588	1,103	77.4%
	Third Party	10	137	175	322	22.6%
	Total	**197**	**464**	**763**	**1,424**	**100.0%**
LGE	Alleged Conspirator/Alleged Affiliate	606	1,431	3,291	5,328	99.8%
	Third Party			9	9	0.2%
	Total	**606**	**1,431**	**3,300**	**5,337**	**100.0%**
MIRAI[3]	Alleged Conspirator/Alleged Affiliate			21	21	100.0%
	Third Party				0	0.0%
	Total			**21**	**21**	**100.0%**
MITSUBISHI	Alleged Conspirator/Alleged Affiliate	54	112	173	339	84.3%
	Third Party	6	39	19	63	15.7%
	Total	**60**	**151**	**191**	**402**	**100.0%**
NEXGEN	Alleged Conspirator/Alleged Affiliate	4			4	100.0%
	Third Party				0	0.0%
	Total	**4**			**4**	**100.0%**
PANASONIC	Alleged Conspirator/Alleged Affiliate	659	1,172	1,943	3,774	95.0%
	Third Party			198	198	5.0%
	Total	**659**	**1,172**	**2,141**	**3,972**	**100.0%**
PHILIPS	Alleged Conspirator/Alleged Affiliate	1,089	367	1,373	2,830	54.5%
	Third Party		1	2,360	2,361	45.5%
	Total	**1,089**	**368**	**3,733**	**5,191**	**100.0%**
PHILIPS/MAGNAVOX[4]	Alleged Conspirator/Alleged Affiliate		2,205	1,577	3,782	78.1%
	Third Party		344	717	1,061	21.9%
	Total		**2,549**	**2,294**	**4,842**	**100.0%**
SAMSUNG	Alleged Conspirator/Alleged Affiliate	820	2,222	6,205	9,247	100.0%
	Third Party				0	0.0%
	Total	**820**	**2,222**	**6,205**	**9,247**	**100.0%**

Exhibit VI.1.c
Share of Alleged Conspirator and Alleged Affiliate Branded LCD Finished Products[1]
Assembled by Third-Party Assemblers (in Thousands of Units)
(Using DisplaySearch Data)
2004 - 2006
Television

Alleged Conspirator/ Alleged Affiliate Brand	LCD Product Assembler	2004	2005	2006	Total Units	Share of Brand Total
SANYO	Alleged Conspirator/Alleged Affiliate	128	379	679	1,186	99.1%
	Third Party	11			11	0.9%
	Total	**139**	**379**	**679**	**1,197**	**100.0%**
SHARP	Alleged Conspirator/Alleged Affiliate	2,204	3,537	5,242	10,983	99.9%
	Third Party			9	9	0.1%
	Total	**2,204**	**3,537**	**5,251**	**10,992**	**100.0%**
TATUNG	Alleged Conspirator/Alleged Affiliate	9	52	125	187	100.0%
	Third Party				0	0.0%
	Total	**9**	**52**	**125**	**187**	**100.0%**
TOSHIBA	Alleged Conspirator/Alleged Affiliate	210	582	1,842	2,635	76.9%
	Third Party	144	293	354	791	23.1%
	Total	**355**	**875**	**2,196**	**3,426**	**100.0%**
VICTOR[5]	Alleged Conspirator/Alleged Affiliate	31			31	0.9%
	Third Party	6			6	0.2%
	Total	**37**			**37**	**1.1%**
Alleged Conspirator/Alleged Affiliate Total		6,095	12,573	23,580	42,248	89.2%
Third-Party Total		270	900	3,953	5,124	10.8%
Grand Total		**6,365**	**13,473**	**27,533**	**47,371**	**100.0%**

Notes:

[1] Alleged conspirators and alleged affiliates are identified according to the plaintiffs' complaints and interrogatories. See Appendix F for the list of alleged conspirators and alleged affiliates identified in each Track 2 Direct Action Plaintiff case.
Alleged conspirator and alleged affiliate brands are identified using the plaintiffs' complaints and interrogatories.
Alleged conspirator and alleged affiliate assemblers are defined as LCD product assemblers who are identified as alleged conspirator or alleged affiliate according to the plaintiffs' complaints and interrogatories.
Third-party assemblers are defined as LCD product assemblers who are not identified as alleged conspirator or alleged affiliate according to the plaintiffs' complaints and interrogatories.

[2] "Hannspree" is identified as an alleged conspirator/alleged affiliate brand because Hannspree is classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

[3] "Mirai" is identified as an alleged conspirator/alleged affiliate brand because Mirai is a TV brand of Nexgen, an entity classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

[4] "Philips/Magnavox" is identified as an alleged conspirator/alleged affiliate brand because Magnavox is a TV brand of Philips, an entity classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

[5] "Victor" is identified as an alleged conspirator/affiliate brand because JVC Americas Corps. (also known as Victor Company of Japan, Ltd) is classified as an alleged conspirator/alleged affiliate according to the plaintiffs' complaints and interrogatories.

Sources:

[1] DisplaySearch Value Chain Data, SECm00093311-20070905_DS_ValueChain_PivotTables_LCD_TV.xlsx.

[2] Complaints and interrogatories relevant to Track 2 Direct Action Plaintiffs cases.

[3] "NEXGEN Mediatech Inc. Service Announcement," *Chimei.com* , http://www.chimei.com.tw/en/news-detail.asp?news_id=13, visited on October 18, 2013.

[4] "Magnavox," *Magnavox.com* , http://www.magnavox.com, visited on October 29, 2013.

[5] "Corporate History," *Jvckenwood.co.jp* , http://www.jvckenwood.co.jp/en/corporate/history/index.html, visited on October 24, 2013.

Exhibit VI.2
Total Unit Volume of LCD Panels Shipped to Third-Party Finished LCD Product Assemblers
(Using DisplaySearch Data)
Monitor, Notebook and Television Panels
Conspiracy Period (August 1998 - December 2006)

	[A]	[B]	[C] = [B]/[A]
LCD Panel Manufacturer	**Total Unit Volume Shipped to Third-Party Assemblers**	**Total Unit Volume Shipped to and Billed to Third-Party Assemblers**	**Share of Unit Volume Shipped to and Billed to Third-Party Assemblers**
AUO	20,945,488	11,094,778	53%
Chunghwa	13,072,780	6,622,223	51%
HannStar	15,456,131	13,973,035	90%
Hitachi	5,148	5,148	100%
LG Display	34,069,633	8,902,678	26%
Samsung SEC	28,178,731	12,139,690	43%
TOTAL	**111,727,911**	**52,737,552**	**47%**

Notes:

[1] DisplaySearch value chain data are available for monitors, notebooks and televisions.

[2] Third-party assemblers are identified using the names of entities that DisplaySearch has identified as ODMs (original design manufacturers) in the value chain pivot tables. Sales of panels to these third-party assemblers were identified using customer names in the panel sales data for a each specific application type.

[3] Chi Mei and Toshiba data do not contain a ship-to-customer name and therefore are not included in this analysis. Transactions without a bill-to customer name are included in column [A] but not in column [B]. The data indicate that NEC, Sharp, and Epson did not sell panels to an LCD finished product assembler not alleged as a conspirator or affiliate.

[4] Unit volumes billed and shipped to third party assemblers exclude panel sales to companies that acts as both assemblers and branded product manufacturers.

Sources:

[1] Conspirator panel sales data from backup to Expert Reports of Professors B. Douglas Bernheim, Ph.D. and Leslie M. Marx, Ph.D., June 13, 2013.

[2] DisplaySearch Value Chain data: SECm00093311-20070905_DS_ValueChain_PivotTables_LCD_TV.xls, SECm00093474-20070905_DS_ValueChain_PivotTables_Note_PC.xls, and SECm00093707-20070905_DS_ValueChain_PivotTables_Monitor.xls.

Exhibit VI.3
Estimates of Pass-Through By LCD Product Manufacturers
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Camcorders	135%	0.04	224
Digital Cameras	120%	0.13	338
Mobile Phones	153%	0.05	369
Monitors	143%	0.09	1,928
Notebooks	109%	0.03	20,139
Televisions	127%	0.01	1,041
All Applications	126%	0.01	24,039
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	75%	0.07	1,788
Digital Cameras	71%	0.04	2,539
Mobile Phones	133%	0.08	5,129
Monitors	106%	0.04	15,943
Notebooks	84%	0.02	96,094
Televisions	117%	0.03	7,281
All Applications	97%	0.02	128,774

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] The LCD product manufacturer sample includes data from Acer, Aopen, Dell, Envision, Funai, Lenovo, Motorola, Sony and Westinghouse. Motorola is the only manufacturer of mobile phones in the sample. Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.4
Estimates of Pass-Through By CompuCom
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Cameras	109%	0.00	605
Monitors	106%	0.00	1,506
Notebooks	104%	0.02	3,887
Televisions	111%	0.03	60
All Applications	103%	0.01	6,079
Prof. Bernheim's Equation 11[2]			
Digital Cameras	100%	0.03	2,902
Mobile Phones	89%	0.07	91
Monitors	95%	0.02	11,254
Notebooks	74%	0.04	14,494
Televisions	123%	0.06	80
All Applications	77%	0.03	28,821

Notes and Sources:

[1] $P_i = \alpha_m + \beta * C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.5
Estimates of Pass-Through By MARTA
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Televisions	100%	0.00	245
All Applications	100%	0.00	293
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	96%	0.02	70
Portable DVD Players	100%	0.00	80
Televisions	100%	0.00	1,450
All Applications	100%	0.00	1,600

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.6
Estimates of Pass-Through By DBL Distributing
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Camcorders	105%	0.01	149
Digital Cameras	105%	0.01	459
Monitors	106%	0.00	155
MP3/Media Players	102%	0.02	180
Portable DVD Players	109%	0.01	188
Televisions	107%	0.00	330
All Applications	107%	0.00	1,483
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	99%	0.03	1,065
Digital Cameras	103%	0.01	3,518
Mobile Phones	123%	0.14	119
Monitors	116%	0.02	1,431
MP3/Media Players	105%	0.04	1,773
Portable DVD Players	110%	0.02	1,717
Televisions	109%	0.01	2,593
All Applications	110%	0.01	12,216

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.7
Estimates of Pass-Through By AT&T
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Mobile Phones	45%	0.05	1,304
Prof. Bernheim's Equation 11[2]			
Mobile Phones	89%	0.08	15,665

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.8
Estimates of Pass-Through By ABC Warehouse
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Camcorders	126%	0.01	252
Digital Cameras	111%	0.01	163
Notebooks	102%	0.02	68
Portable DVD Players	124%	0.02	55
Televisions	123%	0.01	207
All Applications	123%	0.01	778
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	159%	0.04	3,020
Digital Cameras	119%	0.03	2,485
Monitors	113%	0.06	375
Notebooks	125%	0.12	199
Portable DVD Players	134%	0.07	556
Televisions	125%	0.03	2,239
All Applications	127%	0.03	8,874

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.9
Estimates of Pass-Through By BrandsMart
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Camcorders	125%	0.01	281
Digital Cameras	114%	0.00	579
Monitors	109%	0.01	100
Notebooks	114%	0.01	439
Televisions	123%	0.01	142
All Applications	110%	0.01	1,691
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	137%	0.02	3,534
Digital Cameras	117%	0.01	5,740
Monitors	114%	0.02	898
MP3/Media Players	118%	0.15	79
Notebooks	103%	0.06	1,666
Televisions	137%	0.04	1,081
All Applications	128%	0.02	13,572

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.10
Estimates of Pass-Through By Circuit City
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Camcorders	114%	0.01	761
Digital Cameras	114%	0.01	1,263
Monitors	112%	0.01	403
Notebooks	112%	0.01	1,474
Portable DVD Players	124%	0.02	543
Televisions	123%	0.01	693
All Applications	109%	0.01	5,137
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	173%	0.04	16,708
Digital Cameras	137%	0.02	18,913
Monitors	128%	0.03	6,283
Notebooks	141%	0.06	17,445
Portable DVD Players	147%	0.08	2,503
Televisions	151%	0.02	10,685
All Applications	147%	0.02	72,537

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.11
Estimates of Pass-Through By Office Depot
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Cameras	116%	0.02	157
Monitors	97%	0.11	55
Notebooks	90%	0.02	162
All Applications	97%	0.01	402
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	287%	1.10	50
Digital Cameras	146%	0.06	1,999
Monitors	132%	0.05	1,166
Notebooks	166%	0.38	1,181
Televisions	124%	0.10	260
All Applications	138%	0.06	4,787

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.12
Estimates of Pass-Through By P.C. Richard
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Camcorders	113%	0.01	482
Digital Cameras	109%	0.01	404
Monitors	106%	0.01	78
MP3/Media Players	111%	0.01	110
Notebooks	104%	0.01	489
Portable DVD Players	113%	0.02	52
Televisions	121%	0.01	296
All Applications	116%	0.01	2,037
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	148%	0.03	5,803
Digital Cameras	111%	0.02	6,072
Monitors	122%	0.02	1,218
MP3/Media Players	129%	0.04	899
Notebooks	167%	0.04	4,918
Portable DVD Players	134%	0.06	645
Televisions	136%	0.03	3,869
All Applications	136%	0.03	24,853

Notes and Sources:

[1] $P_i = \alpha_m + \beta * C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.13
Estimates of Pass-Through By Tweeter
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
MP3/Media Players	110%	0.03	50
Televisions	124%	0.02	446
All Applications	107%	0.00	1,483
Prof. Bernheim's Equation 11[2]			
MP3/Media Players	134%	0.10	158
Televisions	155%	0.07	4,444
All Applications	110%	0.01	12,216

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.14
Estimates of Pass-Through By LCD Product Retailers
Using Prof. Bernheim's Specifications

Application	Estimate	Std. Error	No. Obs.
Prof. Bernheim's Equation 5[1]			
Digital Camcorders	121%	0.01	3,039
Digital Cameras	114%	0.00	5,103
Monitors	117%	0.01	3,479
MP3/Media Players	110%	0.01	1,178
Notebooks	115%	0.00	11,008
Portable DVD Players	127%	0.01	990
Televisions	122%	0.01	3,973
Prof. Bernheim's Equation 11[2]			
Digital Camcorders	181%	0.03	47,526
Digital Cameras	136%	0.01	73,182
Monitors	124%	0.01	40,691
MP3/Media Players	125%	0.03	16,281
Notebooks	148%	0.03	78,686
Portable DVD Players	152%	0.04	8,099
Televisions	156%	0.02	48,333

Notes and Sources:

[1] $P_i = \alpha_m + \beta^* C_i + e_i$,
where P_i is the quantity-weighted average price of product-model i over its life cycle, C_i is the quantity-weighted average cost of product-model i over its life cycle, and α_m is a manufacturer-specific intercept.

[2] $P_{it} = \alpha + \beta^* C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] Prof. Bernheim's equation 11 is equivalent to equation 2 presented in Section V of this report.

[4] The LCD product retailer sample includes data from ABC Warehouse, Best Buy, BrandsMart, Circuit City, CompUSA, Newegg, Office Depot, P.C. Richard, RadioShack, Sears and Tweeter. Product-model observations for equation 5 and monthly product-model observations for equation 11 are weighted by quantity sold. Equation 5 is estimated where at least 50 product-model observations are available. Equation 11 is estimated where at least 50 product-model-month observations are available for at least two product models. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VI.15
Correlation between Average
LCD Panel Cost and Average Other Handset
Costs in Prof. Blair's Motorola Sample

Motorola handset model	Correlation Coefficient
0D16	0.38
0D81	0.84
0F32	0.29

Notes:

[1] Average other handset costs are calculated by subtracting average LCD panel cost from average total handset cost.

[2] Average total handset cost from Prof. Bernheim's Motorola data and average LCD panel cost from Prof. Blair's Motorola data are merged by model and quarter.

[3] Correlations are not estimated for two of the five Motorola handset models because there was no variation in the average total handset cost, the average LCD panel cost, or both.

[4] Correlations are not estimated for Nokia handsets because information on total handset cost is not available.

Sources:

[1] Backup Production to Declaration of Prof. Roger D. Blair, Ph. D., June 6, 2013.

[2] Backup Production to Expert Reports of Prof. B. Douglas Bernheim, Ph. D., June 13, 2013.

Exhibit VI.16
Sensitivities to Prof. Blair's Analysis of Pass-Through to TracFone

Specification	Pass-Through to TracFone		
	Estimate	Std. Error	No. Obs.
Prof. Blair's specification	179%	0.65	198
Restrict to sample for which handset costs are available	131%	0.73	87
Substitute handset costs for LCD panel costs	35%	0.16	87
Substitute handset costs for LCD panel costs and add time-on-market fixed effects	32%	0.25	87

Notes:

[1] Prof. Blair calculates the quarterly average price that a given handset manufacturer (Motorola or Nokia) charged a given handset purchaser (e.g., TracFone) in a given quarter. He also calculates the average price that a given handset manufacturer (Motorola or Nokia) paid for LCD panels in a given quarter. He regresses the average handset price charged by the handset manufacturer on the average panel price paid by the handset manufacturer, a handset model fixed effect, a purchaser fixed effect, and a year fixed effect.

[2] Prof. Blair restricts his sample to handset models that TracFone purchased from Motorola and Nokia.

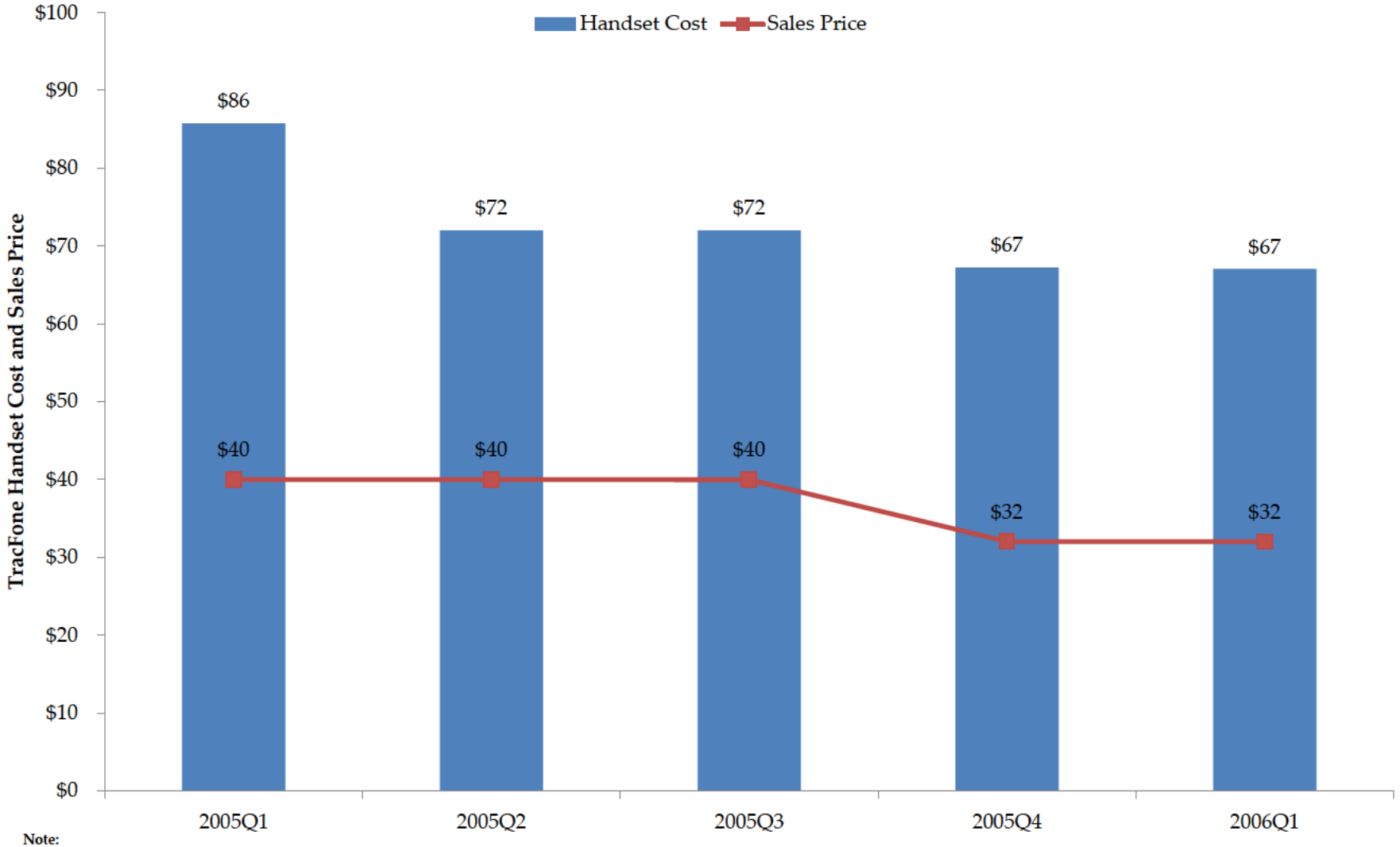
[3] Handset cost data are available for Motorola but not for Nokia.

Sources:

[1] Backup Production of Roger D. Blair, Ph. D., June 6, 2013.

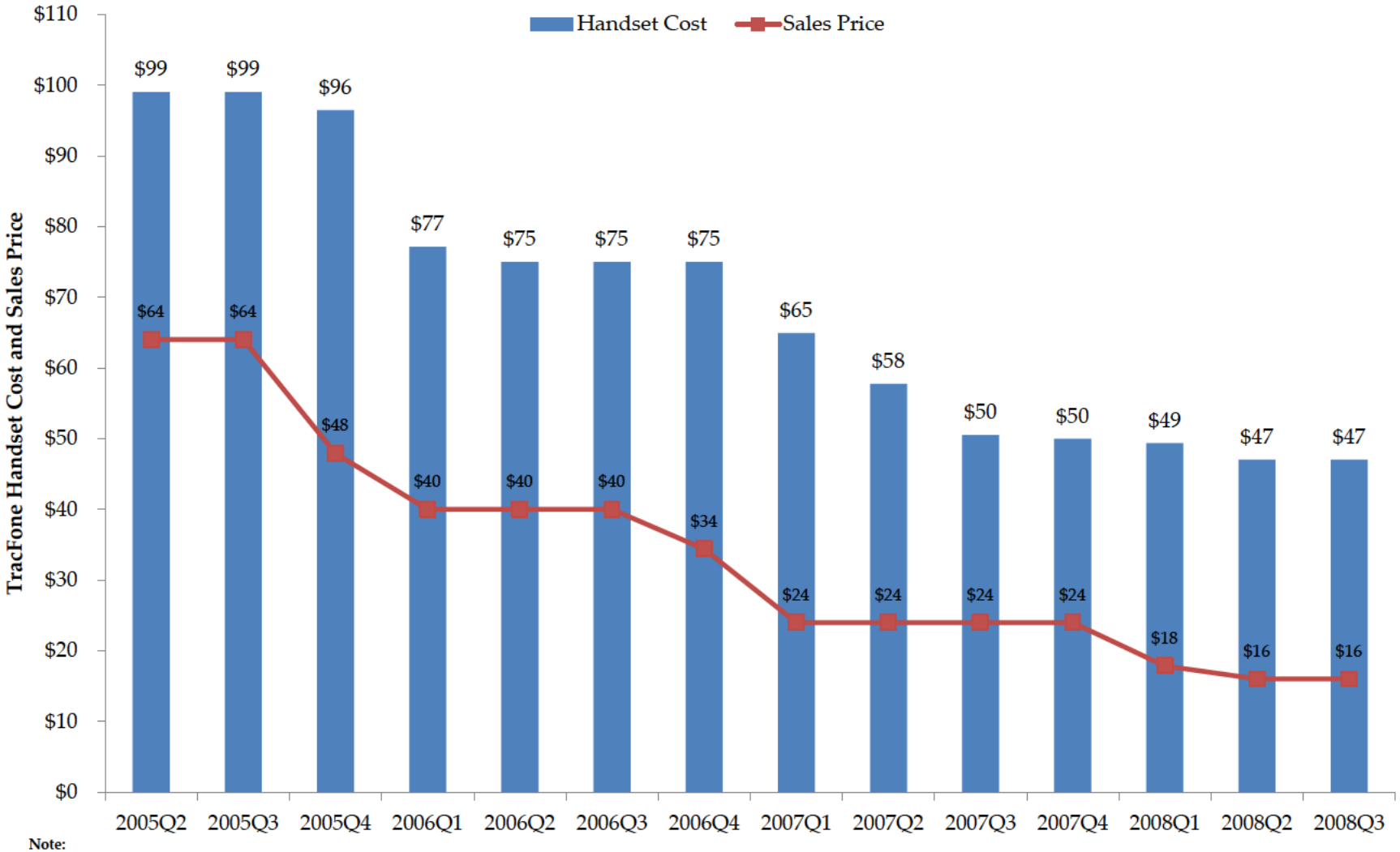
[2] Backup Production of B. Douglas Bernheim, Ph. D., June 13, 2013.

Exhibit VI.17
Cost and Price of TracFone Nokia 2600 Sold to Target
Replication of Blair Declaration Exhibit 27



Note:
[1] Professor Blair calculated TracFone's average purchase cost of the Nokia 2600 and TracFone's average selling price of the Nokia 2600 to Target after removing prices not equal to $40. This exhibit replicates Prof. Blair's Exhibit 27 without restricting the data to observations with a selling price of exactly $40 .
Source:
[1] Backup Production to Declaration of Roger D. Blair, Ph.D., June 6, 2013.

Exhibit VI.18
Cost and Price of TracFone Motorola V170 Sold to Office Max
Replication of Blair Declaration Exhibit 29 Across All Available Years



Note:
[1] Professor Blair calculated TracFone's average purchase cost of the Motorola V170 and TracFone's average selling price of the Motorola V170 to Office Max. This exhibit replicates Prof. Blair's Exhibit 29 without restricting the data to observations with a selling price of exactly $40 and without restricting the date range to be 2005Q4 -- 2006Q4.
Source:
[1] Backup Production to Declaration of Roger D. Blair, Ph.D., June 6, 2013.

Exhibit VII.1
Estimates of Pass-Through By LCD Product Manufacturers

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	134%	0.02	1,917	75%	0.07	1,788	65%	0.11	1,899	20%	0.06	1,768
Digital Cameras	118%	0.12	2,671	71%	0.04	2,539	50%	0.04	2,620	26%	0.05	2,527
Mobile Phones	151%	0.03	5,152	133%	0.08	5,129	104%	0.08	5,129	74%	0.11	5,091
Monitors	145%	0.04	17,347	106%	0.04	15,943	99%	0.04	17,025	78%	0.04	15,689
Notebooks	111%	0.02	102,178	84%	0.02	96,094	78%	0.02	96,961	84%	0.02	90,908
Televisions	130%	0.01	8,025	117%	0.03	7,281	105%	0.04	7,883	86%	0.07	7,081
All Applications	122%	0.01	137,290	97%	0.02	128,774	89%	0.02	131,517	83%	0.02	123,064

Notes and Sources:

[1] $P_{it} = \alpha + \beta^{*}C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \theta_i{}^{*}M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] The LCD product manufacturer sample includes data from Acer, Aopen, Dell, Envision, Funai, Lenovo, Motorola, Sony and Westinghouse. Motorola is the only manufacturer of mobile phones in the sample. Monthly product-model observations in each regression are weighted by quantity sold. These estimates are used as a proxy for pass-through by Syntax Brillian and by manufacturers to plaintiffs. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.2
Estimates of Pass-Through By CompuCom

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Cameras	108%	0.00	3,191	100%	0.03	2,902	93%	0.05	3,070	78%	0.06	2,806
Mobile Phones	99%	0.04	131	89%	0.07	91	81%	0.11	129	55%	0.24	91
Monitors	105%	0.00	11,887	95%	0.02	11,254	93%	0.03	11,583	77%	0.05	11,000
Notebooks	102%	0.01	17,612	74%	0.04	14,494	67%	0.04	16,313	63%	0.04	13,750
Televisions	111%	0.03	119	123%	0.06	80	116%	0.12	86	120%	0.09	68
All Applications	103%	0.01	32,940	77%	0.03	28,821	72%	0.03	31,181	64%	0.04	27,715

Notes and Sources:

[1] $P_{it} = \alpha + \beta^{*}C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \theta_i{}^{*}M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.3
Estimates of Pass-Through By MARTA

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	98%	0.00	97	96%	0.02	70	96%	0.02	88	92%	0.04	66
Portable DVD Players	100%	0.00	95	100%	0.00	80	102%	0.01	87	103%	0.01	80
Televisions	100%	0.00	1,662	100%	0.00	1,450	100%	0.00	1,624	100%	0.00	1,438
All Applications	100%	0.00	1,854	100%	0.00	1,600	100%	0.00	1,799	100%	0.00	1,584

Notes and Sources:

[1] $P_{it} = \alpha + \beta * C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \theta_i * M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.4
Estimates of Pass-Through By DBL Distributing

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	105%	0.01	1,442	99%	0.03	1,065	95%	0.04	1,431	86%	0.04	1,065
Digital Cameras	105%	0.00	4,365	103%	0.01	3,518	99%	0.01	4,347	96%	0.03	3,504
Mobile Phones	104%	0.01	161	123%	0.14	119	117%	0.18	161	87%	0.21	119
Monitors	107%	0.00	1,701	116%	0.02	1,431	112%	0.02	1,694	91%	0.04	1,423
MP3/Media Players	103%	0.01	2,167	105%	0.04	1,773	101%	0.03	2,163	82%	0.05	1,773
Portable DVD Players	109%	0.01	2,315	110%	0.02	1,717	106%	0.02	2,312	96%	0.02	1,715
Televisions	107%	0.00	3,146	109%	0.01	2,593	106%	0.01	3,136	86%	0.07	2,587
All Applications	107%	0.00	15,297	110%	0.01	12,216	109%	0.01	15,244	89%	0.03	12,186

Notes and Sources:

[1] $P_{it} = \alpha + \beta * C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \theta_i * M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. These estimates are used as a proxy for pass-through by Tech Data and by distributors to plaintiffs. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.5
Estimates of Pass-Through By AT&T

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Mobile Phones	47%	0.04	16,679	89%	0.08	15,665	76%	0.10	16,546	59%	0.07	15,603

Notes and Sources:

[1] $P_{it} = \alpha + \beta^{*}C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \theta_i{}^{*}M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. These estimates are used as a proxy for pass-through by wireless carrier plaintiffs (MetroPCS and TracFone). See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.6
Estimates of Pass-Through By ABC Warehouse

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	127%	0.01	3,677	159%	0.04	3,020	116%	0.04	3,656	100%	0.07	3,016
Digital Cameras	111%	0.01	2,653	119%	0.03	2,485	97%	0.03	2,649	73%	0.04	2,481
Monitors	105%	0.02	476	113%	0.06	375	84%	0.06	473	76%	0.06	373
Notebooks	102%	0.02	513	125%	0.12	199	78%	0.11	501	52%	0.13	197
Portable DVD Players	125%	0.02	762	134%	0.07	556	122%	0.09	759	84%	0.07	552
Televisions	123%	0.01	2,461	125%	0.03	2,239	114%	0.04	2,451	98%	0.05	2,233
All Applications	124%	0.01	10,542	127%	0.03	8,874	118%	0.03	10,489	97%	0.04	8,852

Notes and Sources:

[1] $P_{it} = \alpha + \beta^{*}C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \theta_i{*}M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.7
Estimates of Pass-Through By BrandsMart

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	125%	0.01	3,647	137%	0.02	3,534	120%	0.03	3,641	88%	0.04	3,530
Digital Cameras	114%	0.00	6,368	117%	0.01	5,740	99%	0.02	6,360	83%	0.02	5,734
Monitors	109%	0.01	1,022	114%	0.02	898	114%	0.03	1,015	102%	0.04	894
MP3/Media Players	98%	0.03	203	118%	0.15	79	71%	0.11	196	4%	0.24	73
Notebooks	114%	0.01	2,087	103%	0.06	1,666	77%	0.07	2,077	48%	0.08	1,636
Televisions	124%	0.01	1,263	137%	0.04	1,081	125%	0.04	1,258	85%	0.08	1,077
All Applications	111%	0.01	15,316	128%	0.02	13,572	122%	0.02	15,253	81%	0.04	13,518

Notes and Sources:

[1] $P_{it} = \alpha + \beta * C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \theta_i * M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.8
Estimates of Pass-Through By Circuit City

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	115%	0.01	17,789	173%	0.04	16,708	120%	0.04	17,769	60%	0.04	16,704
Digital Cameras	115%	0.00	19,850	137%	0.02	18,913	111%	0.02	19,833	96%	0.03	18,901
Monitors	113%	0.01	6,829	128%	0.03	6,283	109%	0.03	6,805	90%	0.04	6,259
Notebooks	112%	0.00	18,531	141%	0.06	17,445	98%	0.02	18,491	75%	0.05	17,383
Portable DVD Players	124%	0.02	3,407	147%	0.08	2,503	102%	0.10	3,178	87%	0.09	2,481
Televisions	124%	0.01	11,377	151%	0.02	10,685	132%	0.03	11,348	89%	0.04	10,665
All Applications	110%	0.00	77,783	147%	0.02	72,537	133%	0.02	77,424	83%	0.02	72,393

Notes and Sources:

[1] $P_{it} = \alpha + \beta * C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \theta_i * M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.9
Estimates of Pass-Through By Office Depot

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	116%	0.32	69	287%	1.10	50	49%	0.63	67	-50%	0.29	50
Digital Cameras	118%	0.02	2,286	146%	0.06	1,999	83%	0.09	2,261	73%	0.08	1,991
Monitors	100%	0.10	1,233	132%	0.05	1,166	102%	0.05	1,233	83%	0.07	1,164
Notebooks	91%	0.03	1,961	166%	0.38	1,181	60%	0.26	1,961	29%	0.20	1,181
Televisions	81%	0.08	285	124%	0.10	260	13%	0.26	284	55%	0.10	260
All Applications	97%	0.01	6,022	138%	0.06	4,787	79%	0.09	5,994	64%	0.07	4,777

Notes and Sources:

[1] $P_{it} = \alpha + \beta^{*}C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \theta_i{}^{*}M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.10
Estimates of Pass-Through By P.C. Richard

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	114%	0.01	7,233	148%	0.03	5,803	105%	0.04	7,204	108%	0.04	5,801
Digital Cameras	109%	0.00	6,907	111%	0.02	6,072	76%	0.02	6,897	62%	0.03	6,070
Monitors	107%	0.01	1,382	122%	0.02	1,218	112%	0.03	1,377	100%	0.04	1,218
MP3/Media Players	111%	0.01	1,580	129%	0.04	899	98%	0.05	1,578	63%	0.08	897
Notebooks	105%	0.01	5,467	167%	0.04	4,918	83%	0.04	5,454	75%	0.04	4,904
Portable DVD Players	114%	0.02	833	134%	0.06	645	126%	0.11	830	99%	0.11	645
Televisions	122%	0.01	4,304	136%	0.03	3,869	109%	0.04	4,296	80%	0.06	3,863
All Applications	116%	0.00	29,275	136%	0.03	24,853	125%	0.03	29,199	81%	0.04	24,823

Notes and Sources:

[1] $P_{it} = \alpha + \beta * C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \theta_i * M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.11
Estimates of Pass-Through By Tweeter

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
MP3/Media Players	110%	0.02	538	134%	0.10	158	58%	0.11	534	51%	0.22	158
Televisions	125%	0.01	5,069	155%	0.07	4,444	102%	0.08	5,016	56%	0.09	4,412
All Applications	125%	0.01	5,607	155%	0.07	4,602	107%	0.08	5,550	56%	0.09	4,570

Notes and Sources:

[1] $P_{it} = \alpha + \beta * C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta * C_{it} + \delta_i + \theta_i * M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

[6] Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

Exhibit VII.12
Estimates of Pass-Through By LCD Product Retailers

Application	Equation 1[1]			Equation 2[2]			Equation 3[3]			Equation 5[4]		
	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.	Estimate	Std. Error	No. Obs.
Digital Camcorders	121%	0.01	57,186	181%	0.03	47,526	126%	0.03	57,053	70%	0.03	47,490
Digital Cameras	115%	0.00	82,353	136%	0.01	73,182	104%	0.01	82,242	94%	0.02	73,128
Monitors	118%	0.01	45,705	124%	0.01	40,691	106%	0.02	45,492	92%	0.02	40,551
MP3/Media Players	110%	0.01	20,611	125%	0.03	16,281	118%	0.03	20,570	117%	0.03	16,269
Notebooks	116%	0.00	100,780	148%	0.03	78,686	100%	0.01	99,552	93%	0.01	77,912
Portable DVD Players	127%	0.01	11,780	152%	0.04	8,099	107%	0.06	11,536	77%	0.06	8,073
Televisions	122%	0.00	53,858	156%	0.02	48,333	135%	0.02	53,553	89%	0.03	48,159

Notes and Sources:

[1] $P_{it} = \alpha + \beta^{*}C_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t and C_{it} is the quantity-weighted average cost of product-model i in month t.

[2] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, and δ_i is a product fixed effect. The sample is restricted to product-models that appear in the data for at least two months, and for which variation in cost is observed over time.

[3] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \lambda_m + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product fixed effect, and λ_m is a time-on-market fixed effect. The sample is restricted to product-models that appear in the data for at least two months.

[4] $P_{it} = \alpha + \beta^{*}C_{it} + \delta_i + \theta_i{}^{*}M_{it} + e_{it}$,
where P_{it} is the quantity-weighted average price of product-model i in month t, C_{it} is the quantity-weighted average cost of product-model i in month t, δ_i is a product-model fixed effect, and M_{it} is the number of time periods that product-model i has been on the market in month t. The sample is restricted to product-models that appear in the data for at least three months, and for which variation in cost is observed over time.

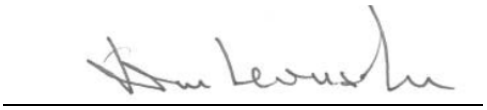
[5] Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey-West procedure (see, e.g., Green, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003, p. 267).

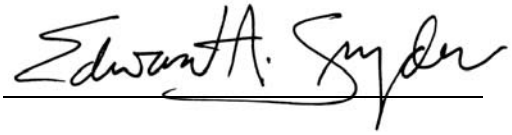
[6] The LCD product retailer sample includes data from ABC Warehouse, Best Buy, BrandsMart, Circuit City, CompUSA, Newegg, Office Depot, P.C. Richard, RadioShack, Sears and Tweeter. Monthly product-model observations in each regression are weighted by quantity sold. See Appendix K for a full description of the data used to estimate pass-through.

ERRATA SHEET TO EXPERT REPORT OF JAMES A. LEVINSOHN AND EDWARD A. SNYDER

I, James A. Levinsohn, do hereby declare under the penalties of perjury that the foregoing report testimony is true and correct (with the exception of the following changes listed below).

I, Edward A. Snyder, do hereby declare under the penalties of perjury that the foregoing report testimony is true and correct (with the exception of the following changes listed below).





James A. Levinsohn

Edward A. Snyder

January 13, 2014

Page(s)	Section	Change	Correction	Reason
27	¶ 51	Instead, he focuses on the "**imperfect** ability to infer whether others are complying with the agreement."	Instead, he focuses on the "**(potentially imperfect)** ability **of the cartel members** to infer whether others are complying with the agreement."	Correction of incomplete citation from Bernheim report.
32	FN 68	Bernheim Circuit City Report, **June 6, 2013**, ¶64.	Bernheim Circuit City Report, **June 13, 2013**, ¶64.	Correction of date.
32	FN 69	Bernheim Circuit City Report, **June 6, 2013**, ¶64; Marshall and Marx, April 2012, p. 7; Marx Deposition, October 9, 2013, pp. 73-75.	Bernheim Circuit City Report, **June 13, 2013**, ¶64; Marshall and Marx, April 2012, p. 7; Marx Deposition, October 9, 2013, pp. 73-75.	Correction of date.
33	FN 70	Carlton Expert Report, **October 30, 2013**, p. 12.	Carlton Expert Report, **October 29, 2013**, p. 12.	Correction of date.
34	FN 72	Bernheim Circuit City Report, **June 6, 2013**, ¶175; Blair Declaration, June 6, 2013, ¶53.	Bernheim Circuit City Report, **June 13, 2013**, ¶175; Blair Declaration, June 6, 2013, ¶53.	Correction of date.
44	FN 88	Prof. Blair's Declaration is discussed in more detail in **Section VI.D.**	Prof. Blair's Declaration is discussed in more detail in **Section VI.E.**	Correction of referenced section.
59 and 61	Tables V.1 and V.2 Note 1	LCD product manufacturers include Acer, Aopen, **Bizcom**, Dell, Envision, Funai, Lenovo, Motorola, Sony, and Westinghouse.	LCD product manufacturers include Acer, Aopen, Dell, Envision, Funai, Lenovo, Motorola, Sony, and Westinghouse.	Correction of list of manufacturers included in analyses.

Page(s)	Section	Change	Correction	Reason
71	FN 144	[…] We report in Exhibit VI.2 that **seven** defendants shipped 112 million LCD panels to assemblers over the 1998 - 2006 period […]	[…] We report in Exhibit VI.2 that **six** defendants shipped 112 million LCD panels to assemblers over the 1998 - 2006 period […]	Correction of number of defendants reported.
82	¶ 183	[…] For the same reasons articulated above, our opinion described in paragraphs **175-178** applies with equal force to Prof. Bernheim's equation 11.	[…] For the same reasons articulated above, our opinion described in paragraphs **179-180** applies with equal force to Prof. Bernheim's equation 11.	Correction of referenced paragraph numbers.
96	FN 191	"This section includes descriptive evidence of TracFone's practice of selling their handsets below cost… This provides supporting evidence of the finding of the low pass through rate."	"This section includes descriptive evidence of TracFone's practice of selling their handsets below cost… This provides supporting evidence of the finding of the low pass through rate **from the econometric analysis**."	Correction of incomplete citation from Blair declaration.
119	¶ 267	"Syntax did not produce matched price-cost data and so we use matched price-cost data for other LCD product manufacturers."[251,252]	"Syntax did not produce matched price-cost data **that are reliable** and so we use matched price-cost data for other LCD product manufacturers." [251,252]	Correction of missing description of why Syntax data were not used to measure pass-through.
127	Table VII.3, Note 1	[…] A more detailed description of the data used to estimate pass-through is provided in **Appendix**	[…] A more detailed description of the data used to estimate pass-through is provided in **Appendix K.**	Correction of cut-off reference.
135	Table VII.4 Note 2	[…] Pass-through by LCD product manufacturers on sales of portable DVD players and MP3/media players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales **of**	[…] Pass-through by LCD product manufacturers on sales of portable DVD players and MP3/media players is assumed to be equal to the average pass-through rate by LCD product manufacturers on sales **of all applications.**	Correction of cut-off reference.
167	Table VII.12 Note 4	Data on sales of **digital cameras, monitors and notebooks** by Tweeter were not available to measure pass-through. Pass-through by Tweeter on sales of digital camcorders, digital	Data on sales of **digital camcorders, digital cameras, monitors and notebooks** by Tweeter were not available to measure pass-through. Pass-through by Tweeter on sales of	Correction to include camcorders in product list.

Page(s)	Section	Change	Correction	Reason
		cameras, monitors and notebooks is assumed to be equal to the average pass-through rate by Tweeter on sales of all applications.	digital camcorders, digital cameras, monitors and notebooks is assumed to be equal to the average pass-through rate by Tweeter on sales of all applications.	
3	Exhibit II.1 Source 4	Write-up of a Site Visit to Asahi Glass in October, 1991 by T. Credelle, report published in June **2002**, http://www.wtec.org/loyola/dsply_jp/ab_asahi.htm, visited on December 5, 2008; […]	Write-up of a Site Visit to Asahi Glass in October, 1991 by T. Credelle, report published in June **1992**, http://www.wtec.org/loyola/dsply_jp/ab_asahi.htm, visited on December 5, 2008; […]	Correction of date.
D-1	App. D FN 4	We determine the earliest and latest date of transactions between each plaintiff and **conspirator** for each product type in the plaintiff and conspirator data. Where the available date ranges overlap, we keep the transactions from the conspirator data.	We determine the earliest and latest date of transactions between each plaintiff and **alleged conspirator** for each product type in the plaintiff and conspirator data. Where the available date ranges overlap, we keep the transactions from the conspirator data.	Change "conspirator" to "alleged conspirator".
	App. E	Prof. Bernheim's Equation 5 is as follows: $P_i \ \alpha_m \ \beta * C_i \ e_i$ […]	Prof. Bernheim's Equation 5 is as follows: $P_i = \alpha_m + \beta * C_i + e_i$ […]	Correction of all instances of where the equation was rendered incorrectly.
	App. E	Prof. Bernheim's Equation 11 is as follows: $P_{it} \ \alpha \ \beta * C_{it} \ \delta_i \ e_{it}$ […]	Prof. Bernheim's Equation 11 is as follows: $P_{it} = \alpha + \beta * C_{it} + \delta_i + e_{it}$ […]	Correction of all instances of where this equation was rendered incorrectly.
E.2-1	App. E.2.1 ¶ 1.b	[…] While we follow **their** identification of direct and indirect purchases, we separately set forth volumes and damages associated with unnamed entities in the tables that follow. […]	[…] While we follow **his** identification of direct and indirect purchases, we separately set forth volumes and damages associated with unnamed entities in the tables that follow. […]	Correction of pronoun.
E.3-1	App. E.3 FN 2	Snow Expert Report, June 13, 2013, **¶10**.	Snow Expert Report, June 13, 2013, **¶9**.	Correction of referenced paragraph number.
E.3-2	App. E.3 ¶2.b	To estimate pass-through **to** Syntax **on its purchases from LCD product manufacturers**, we use data provided by Acer […]	To estimate pass-through **from** Syntax, we use data provided by Acer […]	Correction of description of analyses.
	App. E.3	Pass-through by Syntax is	Pass-through by Syntax is	Correction of list of

Page(s)	Section	Change	Correction	Reason
E.3-5 E.3-6 E.3-7 E.3-8 E.3-9 E.3-10 E.3-11 E.3-12	FN 6 FN 6 FN 5 FN 5 FN 7 FN 7 FN 7 FN 7	estimated using data produced by Acer, Dell, Envision, Funai, Sony, and Westinghouse. […]	estimated using data produced by Acer, **Aopen,** Dell, Envision, Funai, **Lenovo, Motorola**, Sony, and Westinghouse. […]	manufacturers included in analyses.
E.8-15 - E.8-16	App. E.8.e Title	Appendix E.8.e Damages for MetroPCS by Alleged Conspirators and Alleged Affiliates With Pass-Through to MetroPCS Applied to Direct Purchases Conspiracy Period (August 1998 - December 2006)	Appendix E.8.e Damages for MetroPCS by Alleged Conspirators and Alleged Affiliates With Pass-Through to MetroPCS Applied to Direct Purchases **Estimated Using Professors Levinsohn and Snyder's Equation 3** Conspiracy Period (August 1998 - December 2006)	Correction of title.
E.8-7 E.8-8 E.8-11- E.8-20	App. E.8 Tables	**ALPS**	**Alps**	Correction of unnecessary capitalization.
E.9-1	App. E.9 FN 3	Deposition of Martha Rivera, TracFone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL 1827, United States District Court, Northern District of California, San Francisco Division, November 13, 2012**, pp. 39:22-40:8**.	Deposition of Martha Rivera, TracFone 30(b)(6), *In Re TFT-LCD (Flat Panel) Antitrust Litigation*, No. 3:10-cv-03205-SI, MDL 1827, United States District Court, Northern District of California, San Francisco Division, November 13, 2012**, p. 75:5-14.**	Correction of referenced page and line numbers.
E.9-4	App. E.9 FN 6	Not all data are used to estimate damages for a given plaintiff. For example, pass-through to the plaintiff for mobile phones may not be used if that plaintiff does not have volumes for mobile phone purchases. **For a list of the product applications associated with volumes and damages for TracFone, please see Appendix E.9.b.** For details	Not all data are used to estimate damages for a given plaintiff. For example, pass-through to the plaintiff for mobile phones may not be used if that plaintiff does not have volumes for mobile phone purchases. For details on the data used for pass-through, see Appendix K.	Correction of referenced sections.

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		on the data used for pass-through, see Appendix K.		
E.9-7 - E.9-23	App. E.9.a - E.9.i Source 3	**Complaint, TracFone Wireless, Inc. v. AU Optronics Corporation et al., United States District Court, Southern District of Florida, May 4, 2010; TracFone Wireless, Inc.'s Supplemental Responses and Objections to Defendant LG Display America, Inc.'s First Set of Interrogatories, United States District Court, Northern District of California - San Francisco Division, October 19, 2012**; TracFone Wireless, Inc.'s Amended Supplemental Responses to Defendant LG Display America, Inc.'s First Set of Interrogatories, United States District Court, Northern District of California -San Francisco Division, November 16, 2012.	**First Amended Complaint, TracFone Wireless, Inc. v. AU Optronics Corporation et al., United States District Court, Southern District of Florida, November 9, 2010**; TracFone Wireless, Inc.'s Amended Supplemental Responses to Defendant LG Display America, Inc.'s First Set of Interrogatories, United States District Court, Northern District of California -San Francisco Division, November 16, 2012.	Correction of cited complaint.
E.9-7 - E.9-8 E.9-17 - E.9-23	App. E.9.a, E.9.f - E.9.i Source 1	Backup Production to Declaration of Prof. Roger D. Blair, Ph.D., June 6, 2013.	Backup Production to Declaration of Prof. Roger D. Blair, Ph.D., June 6, 2013 **and Backup Production to Expert Report of Prof. B. Douglas Bernheim, Ph.D. concerning Circuit City, June 13, 2013.**	Correction of referenced materials.
E.10-4	App. E.10 FN 3	[…] For a list of the product applications associated with volumes and damages for ABC Warehouse, please see **Appendix E.10.h**. […]	[…] For a list of the product applications associated with volumes and damages for ABC Warehouse, please see **Appendix E.10.b**. […]	Correction of referenced sections.
E.10-19 -E.10-20	App. E.10.g Note 3.c	For direct and indirect purchases, multiply the dollar figure from Step [b] by the estimates of pass-through to the plaintiff. **For**	For direct and indirect purchases, multiply the dollar figure from Step [b] by the estimates of pass-through to the plaintiff and	Correction of description of analyses.

Page(s)	Section	Change	Correction	Reason
		indirect purchases, multiply the dollar figure from Step [b] by the estimate of pass-through to the plaintiff and one minus the estimate of pass-through by the plaintiff	one minus the estimate of pass-through by the plaintiff.	
E.13-3	App. E.13 ¶ 2.a.i	To estimate pass-through to Office Depot on its purchases from LCD product manufacturers, we use data provided by Acer (monitors, notebooks, and televisions), AOpen (monitors and notebooks), Dell (monitors, notebooks, televisions, digital cameras, and digital camcorders), Envision (monitors and televisions), Funai (televisions), Lenovo (monitors and notebooks), Motorola (mobile phones), **Sony (monitors and televisions),** and Westinghouse (monitors and televisions). These pass-through rates are shown in Exhibit VII.1.	To estimate pass-through to Office Depot on its purchases from LCD product manufacturers, we use data provided by Acer (monitors, notebooks, and televisions), AOpen (monitors and notebooks), Dell (monitors, notebooks, televisions, digital cameras, and digital camcorders), Envision (monitors and televisions), Funai (televisions), Lenovo (monitors and notebooks), Motorola (mobile phones), **Sony (monitors, televisions, digital cameras, and digital camcorders)**, and Westinghouse (monitors and televisions). These pass-through rates are shown in Exhibit VII.1.	Correction of list of Sony application types.
E.14-5	App. E.14 ¶ 3.b.ii	[…] These remaining purchases appear to be returns in P.C. Richard's data; as such, we follow Professors Bernheim and Marx's methodology of including these returns in **my** calculation of damages. […]	[…] These remaining purchases appear to be returns in P.C. Richard's data; as such, we follow Professors Bernheim and Marx's methodology of including these returns in **our** calculation of damages. […]	Correction of pronoun.
E.15-9 - E.15-10	App. E.15.b Title	Appendix E.15.b Volume of Commerce and Damages for Tweeter by **Alleged Conspirators and Alleged Affiliates** With Tweeter-Specific Pass-Through Rates	Appendix E.15.b Volume of Commerce and Damages for Tweeter by **Application Type** With Tweeter-Specific Pass-Through Rates Estimated Using Professors	Correction of title.

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		Estimated Using Professors Levinsohn and Snyder's Equation 3 Conspiracy Period (August 1998 - December 2006)	Levinsohn and Snyder's Equation 3 Conspiracy Period (August 1998 - December 2006)	
E.15-9 - E.15-10	App. E.15.b Section Header in Table	Indirect Purchases **Attributed Using Each Alleged Conspirator's Market**	Indirect Purchases	Correction of text in section heading.
E.15-9 - E.15-10	App. E.15.b		Insert "**Notes:"** and "**Sources:"** heading in proper location	Correction of cut-off section headers.
E.15-9 - E.15-10	App. E.15.b		Insert Source "**[3] Second Amended Complaint, Schultze Agency Services, LLC on behalf of Tweeter Opco, LLC And Tweeter Newco LLC v. AU Optronics Corporation, et al., United States District Court, Northern District of California - San Francisco Division, March 16, 2012; Schultze Agency Services, LLC on Behalf of Tweeter Opco, LLC and Tweeter Newco, LLC's (Tweeter) Third Supplemental Responses and Objections to LG Display America, Inc.'s First Set of Interrogatories (Nos. 6, 11), United States District Court, Northern District of California - San Francisco Division, May 17, 2013."**	Correction of missing source.
E.15-18	App. E.15.f Source 3	[…] Schultze Agency Services, LLC on Behalf of Tweeter Opco, LLC and Tweeter Newco, LLC's (Tweeter) Third Supplemental Responses and Objections to LG Display America, Inc.'s First	[…] Schultze Agency Services, LLC on Behalf of Tweeter Opco, LLC and Tweeter Newco, LLC's (Tweeter) Third Supplemental Responses and Objections to LG Display America, Inc.'s First	Correction of cut-off reference.

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		Set of Interrogatories (Nos. 6, 11), United States District Court, Northern District of California - San Francisco	Set of Interrogatories (Nos. 6, 11), United States District Court, Northern District of California - San Francisco **Division, May 17, 2013.**	
F-3	App. F Source 9	**Complaint, TracFone Wireless, Inc. v. AU Optronics Corporation et al., United States District Court, Southern District of Florida, May 4, 2010; TracFone Wireless, Inc.'s Supplemental Responses and Objections to Defendant LG Display America, Inc.'s First Set of Interrogatories, United States District Court, Northern District of California - San Francisco Division, October 19, 2012**; TracFone Wireless, Inc.'s Amended Supplemental Responses to Defendant LG Display America, Inc.'s First Set of Interrogatories, United States District Court, Northern District of California - San Francisco Division, November 16, 2012.	**First Amended Complaint, Tracfone Wireless, Inc. v. AU Optronics Corporation et al., United States District Court, Southern District of Florida, November 9, 2010**; TracFone Wireless, Inc.'s Amended Supplemental Responses to Defendant LG Display America, Inc.'s First Set of Interrogatories, United States District Court, Northern District of California - San Francisco Division, November 16, 2012.	Correction of cited complaint.
M.5-1	App. M.5 Note 3	[…] See Appendix K for a full description of the data used to	[…] See Appendix K for a full description of the data used to **estimate pass-through.**	Correction of cut-off reference.
N-1	App. N Figure		Re-aligned "0%" with the y-axis.	Correction of misaligned axis label.